THE IRON TRADE REVIEW

VOLUME XXIX. CLEVELAND, O. MAY 7, 1896. CHICAGO, ILL. NUMBER 19.

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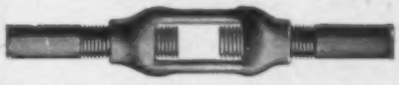
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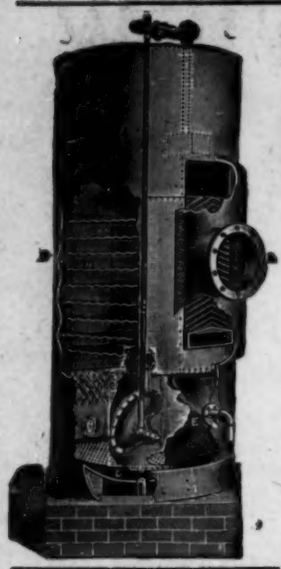

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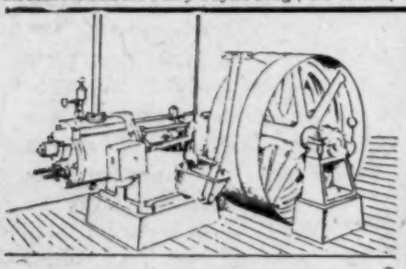

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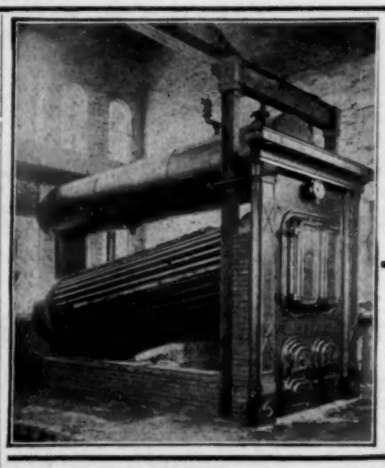

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THE IRON TRADE REVIEW

VOLUME XXIX. CLEVELAND, O. MAY 7, 1896. CHICAGO, ILL. NUMBER 19.

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

The iron trade still finds no satisfactory answer to the inquiry continually going up, as to when and by what agency the long-awaited activity is to be brought about. Much is said about the price agreements in various branches of the trade, as causes of the halt; but there are evidences that most of the waiting is for an emphatic expression, which the business world expects will soon be made, of the determination to embody protection and sound money in the coming revenue and fiscal legislation of the Government. The Bessemer ore agreement is not keeping out of the market buyers who need ore; some whose heavy purchases of 1895 will keep supplied for several months are not yet ready to buy. Similarly the steel billet agreement does not prevent buyers from coming into the market for such material as they need; its effect is to bring consumers to the end of their low-priced raw material at about the same time, after which more liberal buying on the new basis may be expected. As long as business is so inadequate to employ the rolling capacity of the country, it would seem that the big members of the steel pool will have things largely their own way on finished products, as the steel in dealers' hands becomes exhausted. Prices in the week show little change, except that some fresh weak spots appear. Bessemer pig has sold at $13 Pittsburg; a few valley sales are reported at $12.50 at furnace. Steel billets are selling 65 to 90 cents below the pool price, or $19.35 to $19.60 Pittsburg. In the East lower prices have been made on pig iron. A few Pennsylvania brands are held at former figures, but Virginia irons have sold below them. Yet on several thousand tons of iron sold to New York and Pennsylvania mills, Pennsylvania furnaces are reported to have made figures that took the business from Alabama bidders. Some Eastern structural contracts of fair size, expected to be given out last week, are now hung up for revision of specifications. On the bulk of the orders coming up for finished material there is no particular cutting, as the tonnage has not made it an object. In the Central West there is close competition for all the work that is going. Lower prices are heard on angles and steel bars. In some lines of finished material competition from the Chicago district has been quite earnest. Whatever plans are on foot for the reduction of the billet output, they have not definitely materialized as yet. The plan of increasing the tonnage of big mills by the purchase of the allotments of other concerns means economical production for such mills as are kept going. However, nothing in this direction has been actually consummated as yet. Western bar mills count on good orders from the B. & O. car contract. The report that it has been placed with a Western car works is officially denied.

THE CLEVELAND DISTRICT.

Sales of ore, both Bessemer and non-Bessemer, have continued through the week, though the aggregate is probably not so large as for the preceding week. The leading Pittsburg interest is quite well supplied with ores for the next two or three months, owing to its large purchases in 1895, and may not be in the market at once. The early buyers have been able to get such ores as they desire for their mixture—an advantage that may not be shared by those who follow. On soft non-Bessemer ores prices have ranged from $2.60 to $2.90, an advance of from 50 to 75 cents over last year's early prices. The report of dock stocks shows less ore at Lake Erie ports on May 1 than in any four years—a condition that helps to offset the indications of considerably lessened ore consumption in 1896 than last year. The past week has seen the establishment of $1.05 as the season rate from the head of the lake, several blocks of ore being taken for shipment before Nov. 1, while in other cases the contracts run to Nov. 15. It is the expectation that some shippers will bring down all their ore by Nov. 1, so that both these classes of charters may be rated as covering the season. The Escanaba rate has gone to 70 cents this week and the Duluth rate is firm at $1. Grain carrying has made ore tonnage scarce.

Pig Iron Bessemer pig iron has been sold from valley furnaces at $12.50, the past week, but business has been on the most restricted scale. The accumulation of iron in the hands of furnaces promises to be checked by the blowing out of a few valley stacks for repairs. The going reports relative to the Ohio Steel Co.'s plant at Youngstown are of not a little interest to furnace firms in that district. It is denied that arrangements have been consummated for the shutting down of the plant, and it is still operated as usual. Foundry iron has sold in a small way on the basis of $11.50 for No. 2 and $12 for No. 1 strong. Each furnace is a law to itself. Lake Superior charcoal is quoted $13.50 to $14 at Lake Erie port. The minimum price is being well maintained, and some furnaces comfortably sold up on certain grades, are asking an advance of 50 cents.

Finished Material. No distinct development in demand has come in the week, though here and there a better inquiry is noted. Some shading of prices is reported on angles and steel bars, and on tank steel 1.30c.

Continued on page 6.

THE CHICAGO DISTRICT.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

The business of the week in almost every branch of the trade has been considerably smaller than it was the week before. The market continues firm, as to prices, however, and no changes in quotations are chronicled. Sales of pig iron last week were quite a little smaller than those of the week before. Only a small business has been done in bars, although it is reported that the contract for most of the 5,000 cars the B. & O. receivers are to buy was placed with a Western car works the first of the present week, and that orders for the necessary bars will be forthcoming shortly. Rails, billets and rods were all quiet, with only small sales. In structural material a few good orders were placed by railroads, but other business has been quiet. Other classes of material are uniformly in smaller demand, and the outlook for the immediate future is not particularly bright.

PIG IRON.—The reduction in freight rates of 35c a ton, announced last week, makes the Connellsville coke quotation $4.80 Chicago. Northern furnaces report a small week's business and a decrease in inquiries. Prices are firm and there does not seem to be any likelihood of a change either way in the immediate future. Sales of Southern iron last week were small, and the inquiry has fallen off to a considerable extent. The furnaces are refusing to take business for longer than four months' delivery. Lake Superior charcoal iron is in fairly good demand in small lots, and one furnace company has advanced its price 50c, or to $14. Other furnaces maintain the old quotations. Prices are now made as follows:

Lake Sup. Charcoal	$13 50@14 00	Southern No. 2 Soft	$11 35@11 60
Local Coke Fdy. No. 1	12 25@12 50	South'n Silveries No. 1	11 85@12 35
Local Coke Fdy. No. 2	11 75@12 00	South'n Silveries No. 2	11 60@11 85
Local Coke Fdy. No. 3	11 00@11 50	Jackson Co. Silveries	14 50@16 00
Local Scotch Fdy. No. 1	12 25@12 50	Ohio Silveries No. 1	15 00@15 50
Local Scotch Fdy. No. 2	11 75@12 00	Ohio Silveries No. 2	14 50@15 00
Local Scotch Fdy. No. 3	11 00@11 50	Ohio Strong Softeners	15 00@15 50
South'n Coke No. 1	12 10@12 35	Alabama Car Wheel	16 85@17 35
South'n Coke No. 2	11 60@11 85	Malleable Bessemer	13 25@13 50
South'n Coke No. 3	11 10@11 60	Coke Bessemer	13 50@14 00
Southern No. 1 Soft	11 60@11 85		

BARS.—Sales of bar iron last week were smaller than those of the week before, and were mostly in carload lots. The report that the car order for the B. & O. road was placed with a Western car works the first of this week is current, but lacks official confirmation. Quotations are firm, as follows: Common iron, 1.30c to 1.35c; guaranteed, 1.35c to 1.40c; soft steel bars from strictly billet stock, 1.40c to 1.45c.

RAILS AND TRACK SUPPLIES.—Business has been fairly good, but the large majority of the orders are for small lots. No large contracts have been placed. Quotations are as follows: Rails, $29; splice bars, 1.40c to 1.45c; track bolts with square nuts, 2.15c to 2.25c; hexagon nuts, 2.40c to 2.45c; spikes, 1.70c to 1.75c.

BILLETS AND RODS.—The local market has been very quiet, no sales of any importance having been closed. Quotations are unchanged at $21.25 for billets and $29.50 to $30.50 for rods.

STRUCTURAL MATERIAL.—A few contracts from railroads which, have been pending for some time, were closed up last week. The Great Northern road placed 1,200 tons of bridge material with an Eastern mill. The Illinois Central gave a contract for 1,800 tons to a Pittsburg mill. The new Pennsylvania station at Columbus, O., requiring 1,500 tons of material, will be built by a Chicago contractor, and the material will probably come from Pittsburg. A few small order for bridge material, 200 to 300 tons each, were given out last week. General business has been very quiet, and while there are a number of large building projects under consideration in this city, it is not likely that they will come to a head for some time. Prices are unchanged, as follows: Beams and channels, 1.65c to 1.70c; angles, 1.45c to 1.50c; plates, 1.50c to 1.55c; tees, 1.65c to 1.70c. Small lots from stock are quoted ¼c to ½c higher.

PLATES.—The business of the last week has been confined to orders amounting to 100 tons or less and there have not been very many of these. The outlook for the future is not particularly bright. Quotations are unchanged as follows: Tank steel, 1.50c to 1.55c; flange steel, 1.75c to 1.80c; fire-box steel 2.35c to 5c; boiler tubes, 65 and 10 to 70 and 10 per cent discount.

SHEETS.—Black sheets have been in fair demand and one or two good orders have been placed, but the total of the week is hardly up to that of the week before. Quotations are unchanged at 2.30c to 2.35c. Galvanized sheets have been very quiet with only small sales. They are quoted at 75 and 10 and 5 per cent discount.

MERCHANT STEEL.—Dealers report a falling off in sales and a smaller inquiry. The market is quite firm, however, and a better business is looked for after the next three or four weeks. Quotations are unchanged, as follows: Open-hearth spring, tire and machinery steel, 1.85c to 1.95c; smooth finished machinery steel, 1.65c to 1.70c; smooth finished tire 1.60c to 1.65c; tool steel, 5 50c to 7.50c; specials, 11c and upwards; Bessemer bars, 1.55c to 1.65c.

OLD RAILS AND WHEELS.—The market is quiet and only a few small sales have been made. In the absence of any large transactions quotations are almost nominal. Old iron rails, $15.50 to $16; old wheel, $13.50 to $14; old steel rails, $11 to $11.50.

SCRAP.—Very little business has been done by the local dealers and it is not expected that the inquiry will be much greater for the next several weeks. The following are buying quotations furnished by dealers: Railroad forge, $13 to $13.50; dealers' forge, $11 to $11.50; No. 1 mill, $8.25 to $8.50; heavy cast, gross ton, $10; malleable cast, $11.00 to $11.50; axles, $15; cast borings, $5.00; wrought turnings, $6.50; axle turnings, $7.25; mixed steel, $8 to $9; stove plates, $7; heavy melting steel, $10.50 to $11.00.

PITTSBURG.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

The wait keeps up, and in no department of the market is there any vim. There is less skepticism as to the permanence of the steel billet combination, but the disposition to make short time contracts and to keep close to the market is everywhere in evidence. Later on, a start in finished material may lead to some business in steel, in anticipation of a further advance in billets, but evidences do not appear of any broadening of the market. Some mills, it appears, forestalled the present dullness by taking contracts some weeks ago at figures taking no account of the new ore basis. These help to keep rolls turning and afford a slight profit, but they practically give away all the advance to the buyer. The pig iron market is lifeless. The reduction of steel production is reflected in Bessemer pig. Some business has been done at $13 Pittsburg, and occasional sales, 500 tons and 1,000 tons, have been reported at $12 50 in the valley, or $13.25 Pittsburg. There has been some buying of forge iron, and we can report a sale of 1,000 tons and another of 500 tons at $11 Pittsburg; a sale of 1,000 tons at $10.35 in the valley, or $11.10 Pittsburg; while some business has shaded $11 Pittsburg. Buying of foundry iron has been in small lots, with quotations at $12 to $12.25 for No. 2 strong, and $12.50 to $12 75 for No. 1. The steel market has been

governed largely by terms of delivery on steel due middlemen. Mills in the billet pool insist on specifications as they are due, or the cancellation of all low-priced contracts. This has brought cuts of 75 cents and upwards below the pool price of $20.25 delivered. A sale of 1,000 tons was made at $19.40 at maker's mill. Some May and June sales are reported in lots of from 500 to 1,000 tons at $19.80 to $20. The report that the leading local interest had arranged to produce the allotment of the Youngstown steel plant, which would be closed down, was incorrect, but negotiations looking to some arrangement with the Youngstown plant have been going on. The outcome can be more definitely stated by the end of the month. There are some indications that the stronger members of the billet pool will have the lion's share of the business in finished material. If certain plants are run light or are eliminated from the account for the time being, the restricted business in finished material can be taken care of by the largest and best equipped producers. No important work for the mills has come up in the past week. There is some cutting of prices. While beams and channels are held rather closely to the 1.45c. basis, angles have been sold below 1.25c., and it appears that 1.20c. has been shaded in competition at outside points. On universal plates 1.30c@1.35c is the market. There is some latitude in mill quotations, and the quotations 1.35c for tank steel, 1.45c for shell and 1.55c for flange have been shaded. On steelbars 1.15c half extras has been maintained as the Pittsburg price by some mills, but it has been cut in the past week so as to make a flat price of about 1.15c. Bar iron has been a very dull market, with common at 1.20c in the valley and refined selling at 1.30c@1.35c Pittsburgh. Muck bar is quoted at $21 to $21.50. A sale of 1,000 tons at the latter figure is reported. Skelp iron and steel are quiet. Quotations are 1.20c and 1.25c for grooved steel and 1.30c and 1.35c for sheared; 1.30c for grooved iron and 1.40c and 1.45c for sheared. There is some activity in wrought pipe, but not what is to be expected at this season. A Russian inquiry for 150 miles of 8-inch pipe has been heard from in this market, but has not been placed yet. Sheet mills are limiting sales to the next two months, in view of the expiration of the wage scale and of sheet bar contracts. We quoted 2.20c for No. 26, 2.25c for No. 27 and 2.30c for No. 28. We note a sale of 1,000 tons of sheet bars at $22. Black plates are quoted $2.50 to $2.55. Old material continues dull; buyers are contracting for the immediate future and sellers are making lower prices than ruled in early April.

IN OTHER MARKETS.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

Cincinnati. The business of the week has been in the main confined to small lots, 100 and 200 tons, though a few large orders have been placed. An encouraging feature has been the fairly well sustained car lot demand, covering nearly every variety of domestic pig iron. The Lake Superior charcoal iron makers have enjoyed an unusual run of liberal orders, and several of the leading furnace companies have their order books well filled. Minimum prices, established in March and April, have been advanced 50 cents per ton. While the trades and industries generally are quiet, market prices are steady and firm. The reductiun in freight rates on coke from the Connellsville district, will enable coke makers to retain some of their trade which the Virginians have been contesting for successfully. We quote Southern coke No. 1 foundry iron at $10.75 to $11; No. 2 at $10.25 to $10.50; No. 1 soft at $10.25; Jackson county silvery No. 1 at $14; Southern gray forge $9.25; Tennesse charcoal No. 1 at $13 to $13.50; Lake Superior charcoal at $15; Hanging Rock charcoal at $16 to $16.50.

St. Louis. Business is in a rut, but there are hopes of its being lifted out if the B. & O. places a fair share of its contracts with the car builders in this vicin ty It was thought that 5,000 cars would be placed before this, but there has been an unlooked for delay. On May 1, the freight rate on Connellsville coke was reduced 40 cents per ton to East St. Louis.

Buffalo. It has been a quiet week locally, the consumption of pig iron, except in the car building line, being below the average. Scrap continuing scarce has made a place for some of the closer grades of iron and so slightly increased the movement of those grades. There is some talk of advancing the price of Lake Superior charcoal iron. We quote on cash basis f. o. b. cars Buffalo as follows: No. 1 foundry strong coke iron, $13 to $13.25; No. 2 foundry, $12.50 to $12.75; No. 1 Ohio strong softener, $13; No. 2 Ohio strong softener, $12.75; Jackson County silvery No. 1, $15; Southern soft No. 1, $12.15; Hanging Rock charcoal, $18; Lake Superior charcoal $14.

Pittsburg's New Ore Road.

The Butler & Pittsburg Railroad Co. was organized last week at the offices of the Carnegie Steel Co., Pittsburg. The capital is $3,000,000, of which Andrew Carnegie subscribed $2,000,000. The road will extend from Butler, Pa., to Pittsburg, 42 miles. A bridge will be built across the Allegheny river and the Carnegie Steel Co. will bridge the Monongahela. The new line will connect with the union railway of the Carnegie Steel Co. and Jones & Laughlins. The project is practically an extension of the Pittsburg, Shenango & Lake Erie road from Butler. This line will have within a year, when it is expected the new road will be built, a tonnage of nearly 4,000,000. Its 2,100 feet of docks at Conneaut will be extended to 5,000 feet. The Carnegie Steel Co. will get a large reduction in its ore freight—from $1.15 to 53c., it is reported, though the accuracy of the latter figure has been denied.

THE National Electrical Exhibition which opened May 1 in New York at the Grand Central Palace has built its boiler plant and provided the accompanying appliances with a view to presenting an object lesson in automatic operation. A battery of Abendroth & Root boilers of 500 h. p. furnishes the steam. They are equipped with automatic appliances for practically all their operations automatic stoker to supply anthracite coal, conveyor, damper regulator, injector, and electric pump, the latter controlled by a pump governor. This plant is in charge of a woman, as a demonstration of the ease with which a steam plant can be operated, when automatic appliances are employed. The American Stoker Co. has a boiler front and furnace equipped with an American stoker for burning bituminous coal. The stoker does its appropriate work, but the coal is not ignited, the city not permitting soft coal to be used under boilers.

Bids were opened at the Navy Department May 2 for furnishing about 6,000 tons of Harveyized nickel steel armor for the battleships Kearsage and Kentucky. The bidders were the Carnegie and Bethlehem companies. The aggregates of the bids were: For the Kearsage, Carnegie, $1,568,162.50; Bethlehem, $1,573,390; for the Kentucky, Bethlehem, $1,569,750; Carnegie. $1,572,477.50. The prices per ton ranged from $515 to to $628.

AT Titusville, Pa., an organization to be known as the Titusville Industrial Association, Ltd., was formed last week with officers as follows: Chairman, John L. McKinley; secretary and treasurer, Col. J. J. Carter. The capital stock is $250,000, the fund to be used in promoting the industrial growth of the city.

THE IRON TRADE REVIEW

DEVOTED TO IRON AND STEEL MANUFACTURE, FOUNDRY AND MACHINERY TRADES.

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ENTERED AT THE POST OFFICE IN CLEVELAND, O., AS SECOND CLASS MATTER

MAY 7, 1896.

THAT our growing constituency in Pittsburg may be represented in the paper as the importance of its interests deserves, we have opened an office in Room 807 Tradesmen's Building, with James R. Mills, Jr., as manager. Pittsburg has given *The Iron Trade Review* appreciative recognition heretofore and it is believed that the establishment of a branch office there, with a representative on the ground all the time, will be to the advantage of the paper and its Pittsburg constituents.

WITH the meeting of the National Association of Stove Manufacturers at New York, this week, and the first national convention of foundrymen, at Philadelphia, next week, the East is being apprised in an emphatic way, of the forward movement that has come upon the foundry industry. The New York meeting will bring together members of one branch of the trade, who have exemplified the possibilities of compact organization as a conserving and steadying force in working out the problems of labor and markets. At Philadelphia, the questions that will be discussed pertain rather to the technique of the foundry. But if this national convention shall in some way take the initiative in a movement that will bring the foundrymen of the country together on a platform recognizing more distinctly their mutual interest, it will have taken an important step. Whether sub-organizations on lines determined by the character of the product, or on territorial lines, would best serve the purpose, is an open question. But there are signs that the success of the stove manufacturers' movement is suggestive of similar efforts in other lines. Whatever the outcome, the excellent work of the Foundrymen's Association, at Philadelphia, and of the Western Foundrymen's Association, promises to be kept up and become even more effective for the improvemment of foundry practice and the dissemination of practical information. We understatand that both of these 2ssso-ciations are to-day stronger in membership than they have ever been, and it need not be added that their influence s to-day more potent than at any time in their history.

MECHANICS VS. MONEY-MAKING.

A few years ago, when I had more hair and in some respects more enthusiasm than now, I had charge of the mechanical part of quite a large manufacturing business. One day along came a man with a certain thing that he wanted to have made by contract. It was just about the class of work that the establishment was fitted to do, and of course I was detailed to look it over and give my advice on the matter.

As hinted above, I was more enthusiastic in some respects than I am now, and I thought my strong point was knowing a good *mechanical* thing when I saw it. Looking back I cannot now see why my judgment (certainly as far as the mechanical points of the device in question were concerned) was not all right. I reported that the thing was a mechanical monstrosity, and that being a mechanical monstrosity, the less we had to do with it the better. My report was accepted and the contract was refused.

Then the inventor of this affair went to "the other fellow" and "the other fellow" took a contract to make them, and has been running (some of the time nights) ever since to supply the demand.

It is not necessary to explain that I was surprised, and the less said the better regarding what the concern that I was with thought and *did*.

I am, I hope, wiser in some respects now than then. I knew *then*, in a general way, that people would pay for a thing which they thought would give them something for nothing; but I didn't suppose they would be foolish enough to think that this particular thing *would* give them something for nothing, But they did, and "the other fellow" and the inventor, as well, have made a good thing for themselves out of it.

Now, I am wondering what I would do if something else of a similar nature should occur. Some concerns go on the principle that they will make nothing that would be a discredit to them mechanically, and others "take anything that comes along that there is money in." I suppose there is a fine point of ethics in this matter, but it is not the province of this paper to go into that. What I am wondering is, whether it *pays* to let mechanical points be the first consideration. As a mechanic, I wish it did, but I am beginning to be "harrassed with doubts." SCRUTATOR.

THE CLEVELAND DISTRICT.—Continued from Page 3.

Pittsburg, is as common as 1.35c. Beams and channels are firm at 1.45c. Pittsburg, and angles seem to be used in contracts calling for a fair tonnage of beams and channels, as a place to make concessions where competition is close. Bar and sheet mills are for the most part limiting their quotations to May and June business. The former are hedged in by the action of the Amalgamated convention at Detroit, this month, on the puddling rate, and the latter have to face the double uncertainty of labor and sheet bar costs. The demand for bar iron is light. For the most part contracts for steel for bar, sheet and tin plate mills, run out in June and then comes direct dealing with the pool. Thus far no sales of billets are reported at the pool price. Old material continues quiet. We note a sale of old iron rails at $16.50 in the valley. Old steel rails are quoted $12.50 and No. 1 wrought scrap at $12.75.

THE Brightman Furnace Co., of Cleveland, reports an encouraging business outlook. It has recently sold to the Michigan Sulphite Fibre Co., Port Huron, Mich., two of its large machines. The following well known Cleveland firms have

recently purchased furnaces: Goldsmith, Joseph, Feiss & Co., the Garlock-Frazee Laundry Co., Case School of Applied Science (third order), E. H. Jones & Co., and the F. D. Cummer & Son Co., who are using the Brightman furnace in connection with their drying apparatus exclusively, 20th order. The Brightman Furnace Co. has made recent shipments to Germany, Austria, Belgium, England, Australia and the South American countries. A handsome descriptive pamphlet can be had by addressing the Brightman Furnace Co., 648 Broadway, Cleveland, O.

Personal.

John Birkinbine, the well known Philadelphia engineer and iron ore expert, was on the Mesabi range last week in company with General Manager W. J. Olcott, of the Lake Superior Consolidated Iron Mines.

James McLaughlin, recently with the Philadelphia Engineering Works, Ltd., has been elected secretary and treasurer of the Barr Pumping Engine Co., Philadelphia. W. W. Lindsay is the general manager of the company.

Business From the Boiler Maker's Standpoint.

The complaint is general that business is unsatisfactory, but a careful investigation indicates that the trouble is not that there is too little business, but that it is conducted with little or no profit, and this is likely to continue so long as the markets are subject to the manipulation of the iron ore, coke and steel billet combinations. It is quite generally conceded that prices would have reached their present point, through natural demand, but many would-be buyers hesitate covering their requirements, believing that the artificial method of advancing prices is not fully justified by conditions. In this we believe they are wrong. About this time of year there is always talk of labor troubles, though boiler makers would be unwise in attempting to secure any increase in wages or lessening of hours now when business is so profitless. Collections are improving and a natural improvement in demand can be safely counted on. The demand for modern labor-saving tools is quite general, indicating that the buyers are expecting a growing business.—[Boiler Maker.

The Magazines.

Scribner's Magazine for May—and the June issue will have the concluding portion—has for its feature the most intimate account that has been published of Robert Louis Stevenson's home life. It is by Mrs. Isabel Strong, his stepdaughter and amanuensis. "The Evolution of the Trotting Horse," by Hamilton Busbey is an interesting account of the various steps in the lowering of American records, beginning with a dinner in 1818 when a wager was made that a horse could not trot a mile in three minutes. There are other special features and good fiction and poetry in this May number.

Outing for May introduces the reader to a season full of reminders of the attractive employments with which this magazine deals. "The Truth of a Trouting," "Canoeing on the St. John," "Breaking a Bike," "Wild Steeds of the Pampas," "Lenz's World Tour Awheel" and "Black Bass Fishing," are representative titles. Beside these articles there is the usual installment of editorial, fiction and record.

THE Edward P. Allis Co., Milwaukee, Wis., will furnish the Northwestern Elevated Railroad Co., Chicago, three horizontal, cross-compound condensing engines of 2,500 horse-power each and one 1,200 horse-power engine of the same type with armatures for electric generators built on the main shaft of each engine. The railroad is to be operated exclusively by electric power on the third-rail system. The contract covers all pumps, heaters, separators, connections, pipes, etc. The company will also furnish a 1,200 horse-power horizontal tandem compound condensing engine to the Metropolitan Street Railroad Co., Kansas City, Mo.

The Antoine Ore Co., under the management of John T. Jones, will ship largely this year. About 1,000 tons a day is now going to the docks. New machinery recently put in includes a Gates ore crusher with a capacity for crushing 3,000 tons every twenty-four hours; a 250 h. p. Stirling boiler; a 100 h. p. Buckeye engine; two hoists with 5-foot drums, and a Rand eight-drill air compressor. An order has also been placed with Wm. B. Pollock & Co., of Youngstown, O., for sixty one-ton tram cars.

ORE STOCKS ON DOCK.

1,949,698 TONS AT LAKE ERIE PORTS, MAY 1.

Figures communicated to the *The Iron Trade Review* directly from Lake Erie docks show that stocks of ore at Lake Erie ports May 1 were the smallest since 1892, the total being 1,949,698 tons. This is 693,282 tons less than on May 1 last year and 638,672 tons less than on May 1, 1894. Though shipments from some of the docks have been light the past winter, others have reduced their stocks considerably. It is to be taken into account, moreover, that the stocks remaining on dock Dec. 1 last were about 400,000 tons less than on the same date in 1894 much more "direct" ore than usual going to the furnaces in the navigation season of 1895.

Another element in the account which makes it impossible to judge from dock stocks how much ore stands between the furnaces and the new supply, is the amount of ore on hand in furnace yards. With some furnace companies, notably one important interest in the Pittsburg district, this amount is considerable. How rapidly the stocks on docks will be worked off depends much upon the particular requirements of furnaces in piecing out their regular mixtures. Some of these dock ores are standard and will be readily taken up under concessions sufficient to make the price to the furnaces the same as on direct ores. Other lots are not readily salable and may stay on dock for some time. In the figures for May 1, 1896, given below, we have excluded any cargoes of 1896 ore delivered at Lake Erie ports before May 1:

PORTS.	CLOSE OF NAVIGATION.			OPENING OF NAVIGATION.		
	Dec. 1, 1893.	Dec. 1, 1894.	Dec. 1, 1895	May 1, 1894.	May 1, 1895.	May 1, 1896.
Toledo	92 911	96 157	113 132	44,500	32,625	10,593
Sandusky	78,439	77,004	34,375	65,772	67,542	8,442
Huron	89 000	147,632	101,000	56,791	80,864	55,173
Lorain	201,632	223,733	224,264	170,391	185,366	118,820
Cleveland	1,163,930	1,441,785	1,200,792	821,923	718,753	546,691
Fairport	578,033	660,980	605,470	311,494	371,739	346,847
Ashtabula	1,296,431	1,439,119	1,301,302	762,138	787,566	636,254
Conneaut	91,337	199,365	292,460	68,485	118 823	112,406
Erie	359,827	454,233	335 718	222,094	212,643	137,826
Buffalo	1 9,170	94,239	207,199	64,761	57,128	16,644
Total	4,070,710	4,834,247	4,415,712	2,588,370	2,612,980	1,949,698

The total rail shipments from Lake Erie ports to furnaces in the winter of 1895-6 will appear by using the totals of the above table thus:

	GROSS TONS.
On dock at Lake Erie ports Dec. 1, 1895	4,415,712
On dock May 1, 1896	1,949,698
By rail to furnaces in the winter of 1895-6	2,466,014

Adding to this the shipments to furnaces in the season of navigation in 1895 (including consumption of furnaces at Tonawanda, Buffalo and Cleveland, taking ore direct into their yards), which amounted to 6,339,496 tons, we find that the total shipments to furnaces from Lake Erie ports in the year ending May 1, 1896, were 8,805,510 gross tons, far the largest on record. The table below shows shipments from these ports to furnaces in the past seven years:

Year Ending—	Gross Tons.	Year Ending—	Gross Tons.
May 1, 1896	8,805,510	May 1, 1892	5,802,496
May 1, 1895	6,297,215	May 1, 1891	5,148,669
May 1, 1894	4,840,488	May 1, 1890	4,936,637
May 1, 1893	6,102,125		

The statement of winter shipments from Lake Erie ports in the past 10 years is as follows, in gross tons:

1895-6	2,466,014	1891-2	1,971,301	1887-8	855,141
1894-5	2,191,267	1890-1	1,231,264	1886-7	817,168
1893-4	1,482,340	1889-90	1,670,878	1885-6	1,090,648
1892-3	2,053,654	1888-9	1,289,802		

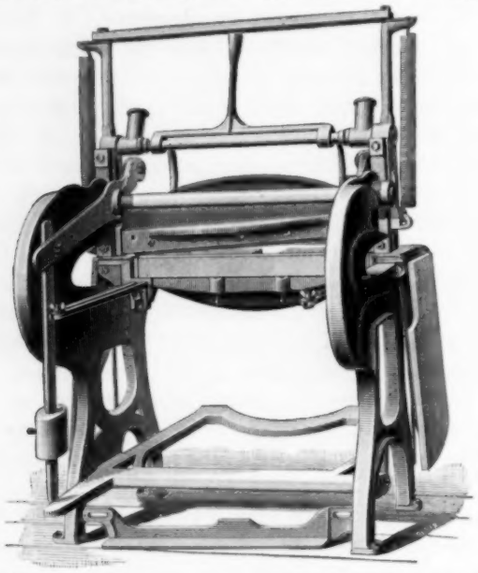
A 10 years' record of iron ore stocks on Lake Erie docks at the opening of navigation, is as follows:

Year.	Gross tons.	Year.	Gross tons.
1896	1,949,698	1891	2,662,223
1895	2,642,980	1890	936 228
1894	2,588,370	1889	558,753
1893	2,095,797	1888	703,720
1892	1,537,188	1887	149,304

IMPROVED GAP SQUARING SHEAR.

Front and back views are given in the illustrations, of the treadle and lever power squaring shears manufactured by Bertsch & Co., of Cambridge City, Ind. The back view gives prominence to the balance weight on the connecting bar. These shears are adapted to light or heavy work, being made in all sizes, with 6-inch to 21-inch throat for 16, 18 and 20 or lighter gauges, and special sizes for Nos. 12 and 14, for slitting wide sheet if desired.

The treadle of the shear is connected with a compound



lever with segment gears, one on each side, which are attached rigidly to a heavy rock shaft to operate the knife bar. The latter has corresponding rack gear, making a treadle shear or hand lever and treadle power combined, which is easily operated and gives additional power for heavy work.

The attachments which give this shear a wide range of service include patent drop leaf or extension tables, with trimming gauge for trimming and slitting sheets quickly and accurately and to avoid marking off; a gauge point indicator at the last cutting end and shearing lines on extension tables at that end; a self-locking hold

down for cutting long sheets or heavy work; a hand-lever attachment, which can be operated in conjunction with the treadle for heavy work; lever, socket and cam to operate the knife bar. These last are cast in one piece, with wide bearing, to turn freely on the supporting shaft, which is rigid, and cannot get loose. The pin and set-screws heretofore used on the lever socket and cams are done away with. Two lever sockets are attached for 16-gauge for heavier shear.

For light work, the treadle is used independently of the lever, as with the ordinary squaring shear. It is noted by the manufacturers that the machine will work equally well without the side springs to raise the knife-bar. The shear is made strong and durable, with few wearing parts to require attention.

GRINDING AND POLISHING MACHINE.

The accompanying engravings illustrate a new grinding and polishing machine of interest to metal workers. Fig. 1 shows the machine set for grinding or polishing pulleys, and a variety of shapes similar to those seen at the base of the machine. Fig. 2 shows the machine set for other shapes. These indicate that the machine has a wide range, excluding only flat plates. The piece to be operated upon is driven lightly on a mandrel, or held in an ordinary chuck, if the piece has

FIG. 1.

no hole in its centre. The mandrel is then placed in the Vs of the two upright arms. These arms are adjustable on a shaft running through a yoke, the lower part of which is a pivot. Movement and adjustment is therefore had from all directions. Revolution of the piece operated upon is obtained by contact with the grinding or polishing wheel. The machine is so arranged that a variety of attachments made for it may be used for the wheel on the other end of the spindle. These consist of devices for plain grinding, surface grinding, twist

FIG. 2.

drill grinding, wet tool grinding, cutter grinding, saw grinding, etc. The machine is made in three sizes by the Appleton Mfg. Co., of Philadelphia.

THE exports of British iron and steel to all countries in the first quarter of 1896 show a large increase over the exports in the same quarters of 1895 and 1894. This year they amounted to 728,294 tons, against 530,248 tons in the corresponding quarter of 1895 and 531,974 tons in the same quarter of 1894. The increase in 1896 has been largely of railroad material to the Argentine Republic, British East Indies and Australasia.

FIRE in the plant of the Smead Foundry Co., Toledo, O., did $50,000 damage; insured.

FURNACE CONSTRUCTION AND FINE ORES.

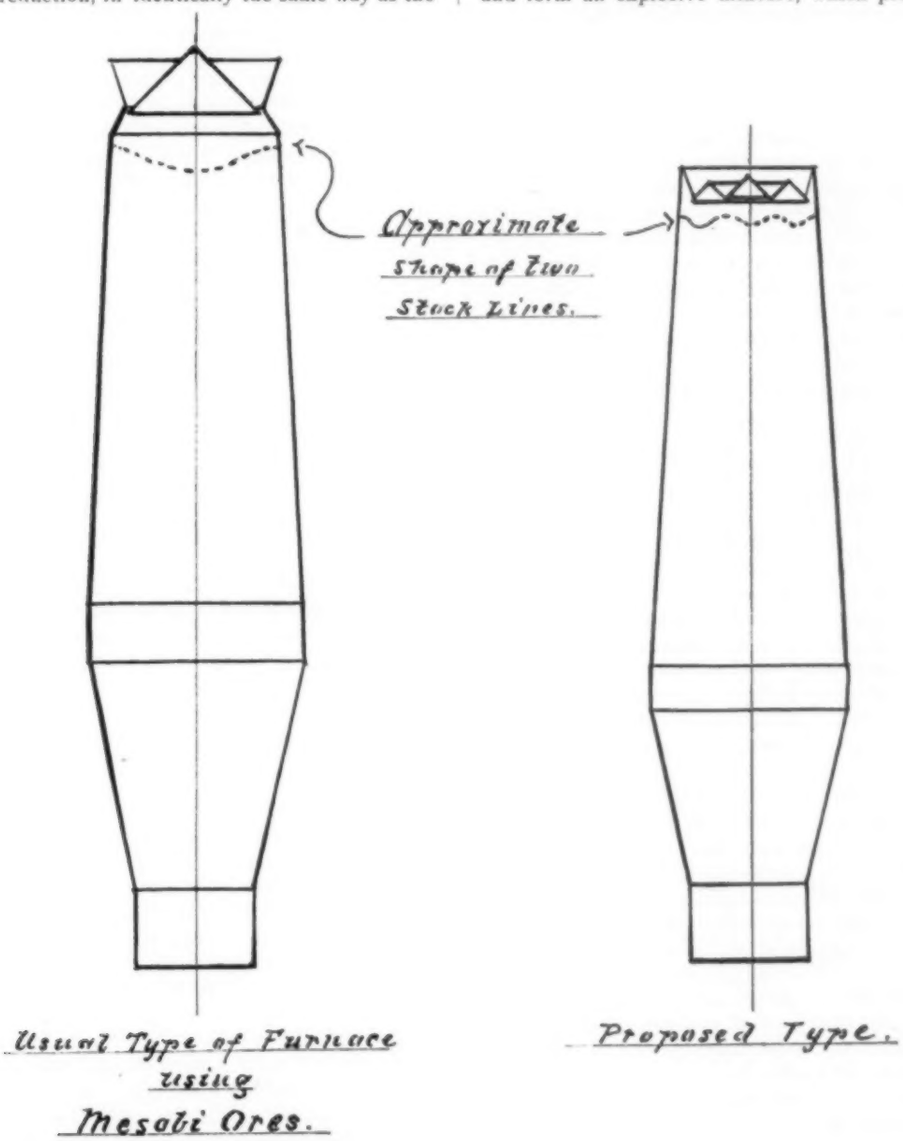
TO THE EDITOR:

I have noted with a great deal of interest the letter of Mr. F. E. Bachman in your issue of April 23, on the deposition of carbon in the Mesabi ores, as compared with carbon deposits in the old range ores; also his remarks as to the cause of top explosions.

It has seemed to me worth while to draw some further conclusions from this interesting paper. As a basis of starting, we will assume that Mr. Bachman's analyses and deductions are correct as to the greater deposition, or more rapid reduction of carbon in the Mesabi ores than in the old range or harder ores. The next question becomes, how to prevent top explosions when using the Mesabi ores. All through Southwest Virginia, the furnaces use a soft brown hematite, which acts, as to reduction, in identically the same way as the Mesabi ores in Mr. Bachman's experiment. Several years experimenting with these ores have proven conclusively that furnaces of medium height—say 70 ft.—with a small bell, sloping in steeply to a comparatively large bosh, give the best results. Reasoning from analogy therefore, it would seem that the proper furnace in which to work Mesabi ores, would be one in which the inward slope of the walls above the bosh should be at least 1½ inches per foot; and, as the Mesabi ores—as conclusively proven by Mr. Bachman's experiment—would be much more readily reduced than the hard ore, the said furnace should be lower than the common type of furnaces now using Mesabi ores.

Another point to which Mr. Bachman calls attention, is the clogging on the walls. This clogging can be largely or wholly overcome by the use of the steeply sloped walls and by the use of a double bell. The common type of bell in furnaces using Mesabi ores, is that of the single cone, the action of which is to throw all the stock to the walls, the fine ore remaining there while the lumps roll to the center, causing the gases to pass up through the center, and leaving the stock against the walls comparatively untouched. Now, if a double cone be used, the stock is distributed in two angular rings around the furnace, permitting free passage of gas through the center and through the intermediate ring, and allowing more thorough access of the gases to the ore, thereby promoting regular work.

The writer is of the opinion that the so-called "explosions," are not explosions in the true sense of the word, but are a combination of a bad slip and subsequent explosion, in which the material slips from near the top of the furnace, leaving a partial vacuum, which is instantly filled with air from the outside. The gases released by the slip, rush up, join the air and form an explosive mixture, which produces very much the same results as if a quantity of dynamite had been thrown under the bell. Now, if a furnace working Mesabi ores be constructed on the principles above described, (because great height is not necessary in so easily reducible an ore) with a double bell, in order to give better distribution of stock, and with walls strongly sloping outward from the top to the bosh, in order to give free play to the swelling of which Mr. Bachman speaks, it is only fair to conclude that such a furnace would give better results both as to prevention of accidents by slipping, with the combined explosion, and as to lower fuel consumption.



Usual Type of Furnace using Mesabi Ores.

Proposed Type.

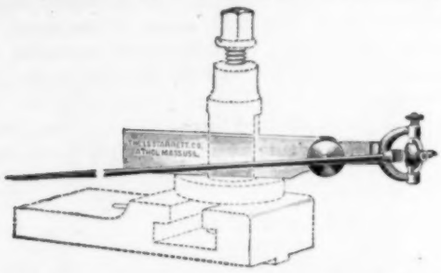
I enclose a couple of outline sketches which will facilitate understanding this letter. GUY R. JOHNSON.

Embreeville, Tenn., April 28, 1896.

PIG iron in American Warrant yards May 1, 108,100 tons.

A NEW CENTER TESTER.

The instrument shown below was designed by the L. S. Starrett Co., Athol, Mass. It is used in adjusting and locating centrally any point or hole in a piece of work operated upon in a lathe chuck or on a face-plate; also to test the truth of lathe centers or a shaft between the centers, the instrument being held in the tool post. Design and workmanship have been well studied by the makers. The indicating needle passes through the ball, having a split stem, forming a chuck



for holding the needle adjusted to any desired length. The ball is pivoted to form a universal joint, but may be instantly converted into a single joint for a tilting motion by tightening the knurled nut, adapting it for both inside and outside surface contact. A steel bead, not shown in the cut, and carried on the needle, slips over the point when used for inside work. The instrument is joined to a tool-post shank by a flexible steel ribbon with sufficient spring to properly hold the needle in contact with the work.

LAKE SUPERIOR IRON MINES.

The Coralia, the largest boat on the lakes, being 432 feet over all, took a record-breaking carge of ore at Escanaba on her initial trip. It amounted to 4,301 gross tons. This could have been increased, but owing to obstructions that would be encountered, the limit of capacity was not attempted. The boat drew 15 feet forward and 15 feet 6 inches aft.

At the Aragon mine, Norway, Mich., a 10 per cent increase in wages went into effect May 1. There is a stock pile of 27,000 tons at the mine. Work is in progress on an engine house for No. 3 shaft and two 20x40 Corliss engines, first hoist, built by the Webster, Camp & Lane Machine Co., will be installed.

Notes are being compared as to the comparative size of some large blasts at Lake Superior mines. At the Winthrop mine, last week, from 10,000 to 13,000 tons of ore was brought down in the open pit. Over half a ton of powder was employed. It is recalled, in the same connection, that at the No. 5 shaft of the Old Colby mine, in 1892, with 250 to 300 pounds of giant powder, used to loosen the ground, and 1,750 pounds for the blast, a pillar was cut out containing 15,000 tons of ore.

President Gates, Furnace Supt. Foote, and other representatives of the Illinois Steel Co., visited the mine of John R. Wood, at Quinnesec, Mich., and the property of the Antoine, Ore Co. last week. A deal is pending for the purchase of the first named property by the steel company.

A large Vulcan shovel has recently been put at work at the Oliver property on the Mesabi—one of the largest shovels ever employed on the range.

The No. 2 shaft of the Queen mine at Negaunee, started up last week, giving employment to 100 men.

The shipping season has opened at the Biwabik mine and 200 men are employed.

A contract has been taken to mine the Kanawha, which adjoins the Hale on the west.

The bailers are in readiness at the Hamilton and Ludington mines, Iron Mountain, Mich., and it was expected that unwatering would begin this week. It is not expected that any considerable amount of ore will be mined this year.

The Alworth Mining Co., chiefly Duluth and Detroit capital, is exploring its lands near Genoa mine on the Mesabi. It also has holdings south of Hibbing.

The Sellers Ore Co. has 75,000 tons in stockpile and is raising 350 tons a day.

The Commodore mine on the Mesabi range has been reopened and bailing is now in progress.

RECEIVED FROM THE TRADE.

Catalogue No. 14 of the L. S. Starrett Co., Athol, Mass., emphasizes tool cutters in its title, but it deals also and chiefly with the fine mechanical tools with which this company's name is always associated. The new tools described for the first time in this catalogue are specified in an insert. These include squares and protractors with metric graduations, several new micrometers, hack saw frames, combination screw driver, brad awl and wrench, new calipers, center tester, levels, etc. In its cutter department the company lists among its new things, worm hobs, stocking cutters, sprocket wheel cutters, concave angular cutters and new cutters for fluting reamers. Standard cutters are carried in large assortment. Annealing facilities have been increased and the company is now able to anneal steel up to 9-in. diameter in 6-ft. lengths.

The 1896 pocket edition catalogue of the Lunkenheimer Co., Cincinnati, is at hand. It deals with the brass and iron valves, lubricators and other steam specialties of this concern and is illustrated. Steam users can have it on application. Special work for engine and machinery builders is a feature with this company.

The Davis & Egan Machine Tool Co., of Cincinnati, O., is mailing to the trade a beautiful hanger. It is finished in 12 colors and is a fine piece of lithographing. It will be mailed upon application.

The latest publication of the Edwin Harrington, Son & Co., Inc., of Philadelphia, is a 48-page pamphlet $4\frac{5}{8}''$x$7''$ in size, devoted to the new Harrington hoist. The feature of this hoist is its independent working chains. The load is carried on two distinct chains, and each link has a breaking strain greater than the rated capacity of the hoist. The changes from the original Harrington hoist are these: The worm-gear, formerly of iron, is now made of bronze, with square hubs instead of clutches, and is driven by a steel worm. The load wheels are made with square holes fitted to worm-gear. The load hook is provided with swivels. A thrust-screw and bronze washer are placed at the end of the worm, for greater safety in lowering. Housing is provided for the worm and gear. In another portion of this issue an illustration of the Harrington hoist and an announcement are given.

"Ventilation and Heating Principles and Application" is the title of a handsome cloth-bound volume of the flat type, lettered in gilt, published by the B. F. Sturtevant Co., Boston. It is a revision and enlargement of the treatise on this subject published by the same company eight years ago, and the preface notes that even this short interval has witnessed a wonderful change in public opinion as to the necessity of good ventilation. The first third of the volume is given up to a general discussion of ventilation and heating methods, capacity required, heating power of steam and formulas pertaining thereto. The principles underlying the Sturtevant system, and its adaptations to the conditions of actual service are elaborated upon in the next section of the work, in connection with illustrations and details of the more important and characteristic types of heating and ventilating apparatus manufactured by the Sturtevant Co. As illustrative of the various forms of service in which this system is employed, views are given of important manufacturing plants, public buildings, office structures and residences. In its mechanical features the volume is unusually attractive, and as a treatise on heating and ventilation problems it will have wide and authoritative currency. From the same company we have its latest catalogue of forges and forge equipment. The blower, as the important factor in the hand forge, is given prominence in the descriptions. Half-tone views are given of the interiors of various shops and training schools equipped with the Sturtevant forge.

THE May *Century* has the first of Prof. Bryce's papers on South Africa, dealing with the external and geographical features of the country. A number of papers on "Photagraphing the Unseen" are contributed, apropos of Roentgen rays. Thos. A. Edison sums up in 13 conclusions the observations he has made. The Alaska boundary question, which the United States must soon face, is the subject of another article. The usual amount of fiction is given. Mrs. Humphry Ward's new novel, "Sir George Tressady," now running in the *Century* deals in part with the labor question.

POINTS IN SHOP CONSTRUCTION.

Horace L. Arnold's second article of his series on "Modern Machine-Shop Economics" appears in the May number of the *Engineering Magazine* under the sub-title, "Prime Requisites of Shop Construction." It is made especially interesting by 30 pages of views of prominent machine shops of the country—sectional views and half-tones. We make some extracts from the portions of the article dealing with floor construction and relating to overhead construction as related to crane service:

In late light manufacturing examples the separate room has been wholly avoded, except for japanning—electro-plating, brazing, and polishing and grinding being placed on the same open floor with all the ordinary light machine tools and vise work. Japanning demands an enclosure by itself, because of dust, and because of its ovens, but chiefly because the dust of any workshop would be fatal to the luster of finished "enamelling," as japanning is now termed by the bicycle makers—although enamelling on metal is a well known art wholly distinct from the japanning in which most cycle framework is finished. The foundry should also be kept in a building or enclosure by itself, although it is not separated wholly from machine-tool floors in the Lane & Bodley shops of Cincinnati. A vast majority of machine shop superintendents would, however, insist that the foundry, and its close adjunct, the castings-cleaning and pickling room, should be in separate enclosures, and the smithy is also thought to be better placed in a separate structure. In many of the cycle factories, which are at present our most advanced light machine shops, brazing is put in a detached building; in other factories brazing fires appear in close connection with machine tools without the slightest inconvenience. Speaking generally, it is undoubtedly correct to put the foundry, the rattlers and pickle-tubs, and the hammers in separate rooms. The drawing-room must also be in a separate enclosure, and should never be, though it often is, a part of a thoroughfare from the office to the shops, or from one portion of the works to another. The old machine shop practice commonly divided the floor space into many apartments, separated by close partitions: now the best shops have but three shop enclosures—the foundry, the smithy, and the machine shop. The great economy of the full open floor is as well understood now as it was in the busy days of Colt's Armory, when many of the 500-feet floors were open from end to end without obstruction. A very decided converse to the open shop floor practice has existed, and still exists, in the Pratt & Whitney, Brown & Sharpe, General Electric, and many other large shops; others again, fully as large as, or even larger than, those mentioned, use one vast floor, every foot of which is open to the simultaneous observation of one man.

Unquestionably, the open floor is in every way to be preferred to the separate room plan for operations which do not interfere with each other. Separate rooms entail a vast amount of needless labor and lost time, even when workmen do their best; where workmen are not more than commonly honest and earnest in their toil, they fall before the temptation of convenient obscurities, and drop into easy habits of chatting and loitering in spots where the eye of the foreman is not likely to reach them. Separate rooms also waste a very large floor space and intercept light, which is always insufficient in side-lighted rooms, and, taken all in all, perhaps no mistake in shop design is productive of more evil results than that of placing each department or subdivision of work in a separate enclosure. Emphatically, the separate rooms in any workshop should be as few as possible. The drawing room, pattern shop, and model room or experimental construction room, are all closely allied departments, and should all be above the first floor, because of dust, and should all be of easy access from the offices. The model or experimental room is often made a part of the tool-making department; it is often locked up away from everything else, as it unquestionably should be. The development of a new idea is best carried out in secret. For many reasons the offices of the machine shop should be on the second floor. The second floor is, in almost all cases, cleaner, better ventilated, and in every way a more desirable location than the first floor. If the ease of the visitor is to be studiously considered, an elevator can be used. One flight of easy stairs is not a serious objection to the second-floor business office, and a second-floor office is above the dust of the street, which by itself is advantage enough to warrant an elevated location.

None of the early shops were supplied with the traveling crane, now regarded as absolutely indispensable. In Colt's Armory the work was so light as to render cranes needless; in heavy New England shops, like the Birmingham Iron Foundry, the Farrel foundries at Waterbury and Ansonia, the Woodruff & Beach Works at Hartford, and the Builders' Iron Foundry at Providence, were scantily supplied with jib cranes; the South Boston Iron Works had one large lathe built for the United States government for heavy gun construction, served with a small traveling crane; both lathe and crane are now at Watervliet Arsenal, West Troy, N. Y., the lathe being much nearer modern lines than the crane. The use of a jib crane which could place a heavy piece on a trolley, and another jib crane to take the piece off the trolley, was the accepted practice until recently. Up to the time of the electric crane there was no perfectly satisfactory traveling crane; Sellers had done, possibly, the best that ever was done with the shaft-driven traveling crane; the air driven traveling crane has the dragging air hose, and the rope driven cranes are comparatively slow in action. The light air-hoist traveling crane, now so common in good foundry equipments, is not many years old in America, and it is safe to say that up to 1890 the advantages of the traveling crane and the air hoist were not generally understood by our machine shop managers. The advent of the electric-driven traveling crane revolutionized shop construction for heavy work; the use of this admirable application of electric power transmission effected such savings in handling work as to force its installation in every new shop, and a shop floor full of machine tools and covered by a traveling crane overhead demands a building and method of power transmission for tool-driving not known in this or any other country until late years. For all shops handling pieces of as little as 500 pounds' weight even, the traveling crane is needed, and where the work reaches into ordinary steam-engine proportions, this agent is indispensable.

The Walker Mfg. Co.'s shop, Cleveland, are said to be among the first, if not the very first, of American machine shops fully equipped with traveling cranes; at the present time no shop intended for heavy work would be built without the installation of traveling cranes wherever they could be made useful, and the type of shop cross-section illustrated in the Walker, Niles, and Laidlaw-Dunn-Gordon shops lends itself so readily to traveling-crane requirements that it has come to be regarded as settled practice.

Space does not permit any extended consideration of the important points of machine shop design affected by power transmission and crane support. Present practice warrants the prediction of electric driving, probably with a continual decrease in the use of leather belting, down to the minimum of a single belt for driving individual tools; possibly, the present favorite practice of electric-driven short-line shafts may become the standard; cranes will be altogether electric-driven, and the air hoist will be largely used.

This paper is written in the full belief that the form of machine shop buildings has a very great influence on the labor cost of machine work. It may seem impossible to the experienced machine constructor that really good and really well equipped and well managed shops can be handicapped by the mere shape of buildings to the extent of 10 per cent. in the total labor cost of production; yet, the writer is convinced, by a very extended observation of the machine shops of the United States, that the difference of labor effect amounting easily to one hour in every ten hours of labor time can be gained by the use of the best form of shop structure.

It is believed that machine shop construction variations tend steadily towards one certain well-defined form of shop plan, and that this ultimate ground-plan can be perfectly supplemented by either wood or brick walls roofed in either of two forms; one, the ordinary ventilated gable roof, of which the Sterling Cycle shops and others are examples; the other, the saw-tooth roof of the Straight-Line and De La Val shops. Of these last two shops only one is homogeneous, so far as the workshop roof is concerned, while no instance is known in which the entire assemblage of stores, offices and workshop is either walled or roofed in the same manner.

MACHINE SHOP AND FOUNDRY.

Cleaning Cavities in Castings.—To get the cores entirely removed from small castings is something of a job, and tumbling does not always do the work satisfactorily. Here is an idea that is worth trying, as I have seen it worked successfully in one place. It should be added, however, that it is only applicable to brass. Before the casting is perfectly cold dip it into water, and the steam formed on the surface of the metal will blow off every particle of sand and leave the casting as fresh and clean as though its interior had been made into a tumbler and run until is was worn bright. It will not do to be careless in the handling, since if the metal is plunged in too hot it is apt to be softened or cracked; but after a short experience the scheme can be worked as a great labor saver. The man I saw using it would handle his pieces about as fast as the ordinary laborer could be prevailed upon to throw them into a tumbler. This use of steam is a great thing for blowing chips out of the bottom of a deep hole. A few years ago I had occasion to drill some ¾ in. holes into a shaft to the depth of 13 in. To clean them with a worm and waste was simply impossible, but a blast of steam from a 3-16 in. nozzle run down to the bottom of the hole did the work in about 30 seconds. We used steam because we did not have compressed air, but the latter would have been more satisfactory still, since it makes no sloppy muss. And apropos, how can anyone in this day and generation, get along without an air compressor and hoists? While I am on the subject of cleaning out deep holes, let me add that, when they are being drilled, the drills sometimes break off short, and this will be when the hole is nearly finished, and the piece left behind is invariably wedged into the hole in the tightest possible manner. I drilled the holes above referred to with home-made flat drills and breakages were not uncommon. On the first occasion I attempted in vain to pull the piece out, but a a resort to gunpowder did the job. I poured in enough rifle powder to cover the piece, first running a fast burning fuse down to the bottom of the hole, then rammed in about two inches of paper and touched it off. There was a report, a scattering of coal in the bin towards which the improvised gun was aimed, and the broken end of the drill was lost to our sight forever, while a fresh drill was used to finish the hole. —[J. H. Allen in Dixie.

* * *

The Doherty Process for Foundry Mixtures.—Thos. Doherty, of Sarnia, Ont., who has carried on not a little original investigation of foundry phenomena, has recently written in a Canadian journal on the Doherty process for the manipulation of foundry iron. The inventor claims for it that a stronger, softer and more uniform casting can be produced from a cheaper class of raw material than by usual methods. He says: "A very fine metal by this process can be produced from three parts scrap of low grade and one part second quality pig iron, or from three parts mill pig and one part No. 3 foundry pig. This latter mixture has recently been experimented with at the request of American founders, who prefer using all pig instead of scrap, and the results have proven very satisfactory. By the introduction of H_2O in combination with the air blast in the cupola a more strict dissemination of the organic and inorganic matter of the metal is obtained, and the oxidized portion is resmelted, which otherwise would be wasted by being carried off with the slag. Some may say there is no organic matter in iron, but this is an old and vague idea, not in keeping with the present advancement in the science of chemistry. Very true, metal belongs to the mineral kingdom, but there are two other kingdoms in nature, the animal and vegetable, which furnish quite a large number of substances; although these, when discovered, were productive only of organized living structures and were termed organic many years ago, but a very considerable amount of organic compounds can now be obtained artificially, independent of living organisms, and therefore the old distinction drawn between organic and inorganic matter is less pronounced. Thus the laws of animate and inanimate nature may be now safely adopted, as in the case of the carbon compounds. Carbon dioxide and carbon mon-oxide and the carbonates are met with in the mineral kingdom and are of course inorganic compounds, but they are also met with in the organic kingdoms too, and are therefore organic compounds also.

"Take for example charcoal pig iron. It contains carbon which must have been absorbed from the charcoa'—a vegetable compound. The phosphorus may have been absorbed by the ore from vegetation also, or from decaying bones in a state of decomposition, or it may have had its source from the phosphates of the earth, or from all these sources, in which case the very deleterious element certainly would be of both organic and inorganic origin. All the elements usually present in pig iron have some beneficial effects when present in the proper proportions, but the trouble is to get an iron with the right proportions, and here the skill of the best posted foundryman come into play. The cupola is the test tube in the foundryman's laboratory. On his skill in handling this tube depends very much the commercial value of his castings. If they are hard and brittle they are of very little use for most purposes, but if soft, tough and uniform, and void of internal stress, they are valuable for most any purpose. Every foundryman cannot be an expert metallurgist, even if he tried ever so hard to master it, because it is a science that very few indeed have ever succeeded in mastering, even to a very limited degree. Then the next best thing he can do is to adopt some simple method of disseminating this organic and inorganic matter in the iron so that if he cannot anticipate what is in his raw material he can so regulate a certain method of securing such results as his product requires. This he can do by adopting the Doherty process in his foundry."

* * *

Methods of a Progressive Car Wheel Foundry.—The extensive car wheel works of the Griffin Wheel Co., of Chicago, is noteworthy both for its extent and for the advanced methods and economies it has worked out in its long career. As examples of the progressive policy pursued, are the 35 pneumatic cranes in the molding room, each of these enabling two men to handle molds and wheels to advantage. Chemical and physical testing work has been carried to a high state of efficiency in the Griffin works, and while the results in this direction do not find their way into print, it is well known that the value of chemistry in the foundry is thoroughly appreciated by this concern. The sand blast for cleaning castings is employed, and as the wheel is enclosed in a box the blast is brought to bear upon it and sand and scale are removed in an incredibly short time. From an excellently prepared illustrated article on the methods of the Griffin works, contained in the May issue of the *Street Railway Journal*, we take the following:

"The arrangement of the works for handling iron is peculiarly effective. There are two large cupolas, each capable of melting iron for 425 wheels per day. They are placed in a separate cupola house where the charging and rough work is carried on by itself. The advantage of having them in a separate house has been shown by the fact that the cupola room has once been burned out without disturbing the molding building. These cupolas discharge into great tilting ladles, each of which delivers contents into the foundry.

"There are two very important features in the system employed in the works which go very largely toward producing perfect wheels. One of these is the large ladle by means of which a uniformity of metal is secured. The second is the use of a bottom pouring ladle, invented and patented by H. H. Fisher, superintendent of machinery. By this only clean iron is allowed to enter the mold, sand, slag and impurities generally rising to the surface. A rough idea of the plug and the method by which this desirable feature is secured can be given. In the bottom of the ladle there is a hole lined with graphite and closed by a specially prepared plug of the same same material. This plug is carried on the end of an iron rod which is protected irom the action of the molten iron by a covering of fire clay. An arm coming from a lever worked outside of the ladle serves to raise and lower the plug. This opens and closes the opening in the bottom of the ladle and thus controls the flow of metal. The desirability of bottom pouring has been recognized by founders for years, but the difficulties in the way of accomplishing it in a simple and mechanical fashion have been so great that very few foundries have ever succeeded in using bottom pouring ladles. The

obstacles in the way of their use have been the difficulty of finding a material which would withstand the extreme heat and cutting effect of the iron and, at the same time, to quickly and accurately close the ladle when the mold was full so as to prevent the waste of iron. These are all overcome by Mr. Fisher's invention.

"To have clean iron flowing into the mold is not however, sufficient to guarantee freedom from sand washes and the collection of dirt on the way from the ladle through the gates into the mold. In the Griffin foundry clean iron in the mold is obtained by a device at once ingenious and simple. When the iron comes from the ladle it drops into a bowl or feeding head the bottom of which is formed by a hard disk molded of dry sand. This disk is prepared in precisely the same way as a core would be and is perforated by ten 1¼-in. holes. This strong dry sand plate resists completely the tendency to wash and the iron is delivered into the molds clean. The resulting wheels by their freedom from dirt and sand show pretty clearly the advantages of these improvements in casting.

"The perfection of a car wheel is not however altogether dependent upon the facilities for casting, the size of the foundry or its capacity for melting iron. A complete knowledge of both physical and chemical qualities of the iron are also necessary. The Griffin Co. in order to produce a first class wheel analyzes its iron for silica, manganese, carbon, sulphur, phosphorus and iron, and divided the carbon into three forms, graphitic or non-metallic, carbide and hardening carbon. Old wheels which must be extensively used in any foundry are most carefully graded by their fracture. When a lot of wheels of any particular make are received they are carefully analyzed so that it may be known not only from analysis but from the physical character of all the iron used what may be expected from it in the cupola.

"As both iron and wheels are subjected to analysis, the cupolas are also charged by analysis. With these means to an end, the company makes the end sought the obtaining of a wheel which will give the maximum wear with strength enough for the service to which it is subjected.

"The conditions under which wheels are made have much ts do with their durability and strength. Not only must the quality of the iron be known, but the time of the heat (by the molder's record for the day), the condition of the metal at the time of pouring, the weather, the distance from the mold to furnace and even the position of the mold relative to the doors, etc., are all matters that should be known. They all have their influence on the quality of the wheel. For example, it is found that a wheel may show a deep hard chill, the chill appearing perfect to the eye; the iron will be chemically all right, and yet the wheel is found to be brittle. Investigation of the causes would show that such a wheel might have been poured when the iron was too cold. As a case in point, a 30 inch wheel showed a chill of 1 1/16 ins. It was of good metal as shown by analysis, and was hard and round. Such a wheel except for certain indications would have been considered absolutely perfect, but it was found to be brittle and investigation developed the fact that the metal was too cold when it went into the mold. The moral of such things as this is that the superintendent must to a considerable degree depend upon his wheel maker for a perfect wheel. Judging the quality by its performance, specifications of the quality of iron is of little use, since the famous Salisbury iron might be so handled as to make a wheel of but insignificant wearing qualities.

"These facts lead the company to exercise a remarkable degree of care over every individual wheel that leaves its establishment. The company's wheel records are commenced each day by giving each molder a list of the wheels which he shall make and the numbers which he shall put upon them. The charges for the cupolas are also determined in advance and molds for test pieces made so that the quality of iron going into each wheel is not only decided in advance, but means taken to know whether the result desired has been attained. When the work is done, each wheel is inspected, calipered, and a record made which shows who made it, when it was poured, from what heat, its chemical composition, its physical condition and the part of the charge from which it was taken. There are also numerous other facts connected with the wheel, all having a bearing upon its durability, strength and form, which are carefully recorded and with a systematic regularity which makes it practically impossible to have any one wheel escape. Penalties for the workman who makes mistakes eliminate to a large extent imperfections.

"Every individual wheel which has left the foundry, and there are 1,250,000 of these wheels now in service, can be identified, and all the information about its manufacture obtained from the record books. A still further record is kept in a graphic way in one of the rooms, which enables the managers to note the changing chemical and physical aspects of the output, and to correct any tendency to error before it has time to make its appearance as an actual quality in the wheels."

* * *

Various Uses of Milling Machines.—A liberal synopsis was given in these columns two weeks ago, of the interesting paper on "The Development of the Milling Machine for Heavy Engineering Work," read by Samuel Dixon, at the recent meeting of the Manchester (Eng.) Association of Engineers. The discussion of the paper brought out a number of interesting views, which we append:

Mr. Hans Renold said, milling machines, no doubt, would be more largely adopted in engineering works in the future. The construction of the cutter, he thought, more important than that of the machine itself, and however good the latter might be, good work could not be done with a bad cutter, whereas good work was possible with a good cutter on a poorly-designed machine. Mr. Renold showed a number of specimens of milling cutters of the newest designs, observing that the pitch had been gradually enlarged.

Mr. Saxon thought that existing ordinary tools had not been improved and developed to the extent that was possible, and much might be done in the direction of utilizing the return stroke of planing and slotting machines. He asked whether in shops having only a limited number of tools, it would be advantageous to immediately replace the old machies with milling machines, or make the change gradually, so that the men might be educated in the methods of milling. He questioned whether milling would save in cases of breakdown work, which was very conveniently done with the ordinary machines.

Mr. Webb asked whether milling could be recommended for slotting large cranks for mill engines.

Mr. Beastow said Mr. Bodmer, of Manchester, had, in 1824, made what he understood to be the first milling machine. Milling machines would never entirely drive out the slotting and planing machines, but if there were special machines for the different operations, and not universal machines, they would, under that condition, occupy a most important place in large engineering workshops.

The president, Mr. Nasmith, condemned the practice of insisting upon machines specially designed according to the purchaser's ideas for every little operation, instead of accepting the standard pattern, thus giving makers much inconvenienc and needless trouble. He thought circular milling should be more generally adopted in some directions. No doubt the cardinal feature of good milling machines was the cutters, and it was not till the grinding of these was paid attention to that any success was obtained.

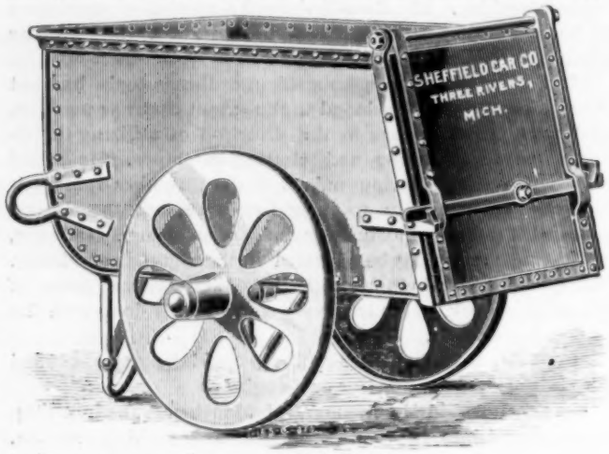
Mr. Dixon, the author of the paper, said, with regard to machines for heavy engineering work, the machine should be adapted to the particular object for which it was intended. They could not be made by the gross. Mr. Nasmith's remarks applied more to the smaller class of machines. In answer to Mr. Saxon, he thought milling machines should be introduced gradually into a shop, otherwise the workmen would never be able to use them. No doubt, milling machines were more costly than planing, slotting and shaping machines of the same size, but this was due to the better finish and mechanism required. Mr. Saxon was mistaken in thinking milling would not do for breakdown work; with the face and spiral cutters they could cover almost any surface. He should think the ordinary slotters would act best for the large cranks referred to by Mr. Webb, which, before finishing, had scarcely any form suggestive of a crank.

THE Union Iron Works, of San Francisco, recently shipped nine steel barges to Russia. They will be used for the navigation of Siberian rivers in connection with the construction of the Trans-Siberian Railway.

ORE AND COKE BUGGIES.

The Sheffield ore buggy, illustrated below is used for handling ores of various kinds in furnace work. It is made as low as consistent with carrying a considerable quantity of material, the total height of boxes from floor being 2 feet 1¾ inches. It consists essentially of a steel box ⅛-inch thick, corners stiffened with 1½x1½ angles thoroughly riveted in place, the upper edge of the box being bound with steel angles of lighter section. This box has a swinging door so arranged as to trip automatically against a tripping stake and release the contents. The load is carried upon 1¼ inch steel axles, upon which run wheels of as large size as comports with carrying the body of the car low down. In this instance, these wheels are 20 inches in diameter. They are rolled from steel boiler plate; combining lightness and strength. The box is hung midway upon these wheels, and with the wheels of good size, the load can be handled from point to point with ease. Suitable handles are provided at the rear for the person using it, being made practically continuous with the angles which stiffen the box. Supporting feet are placed at the rear, so that the load may rest upon them when not in motion. The capacity of the car is 7 cu. ft. or 5⅜ bushels.

The hubs of the wheels are provided with the Brunton self-oiling device, by means of which they are operated for a long ime without oiling. Wheels with this hub have been run for



COKE BUGGY.

a little over three months before it was necessary to re-oil them. This ore buggy makes it possible for one person to handle a heavy load and dump it at the charging door without assistance. The supporting feet and axles can be made so as to be taken off by removing certain bolts, where this is necessary for getting the car into a small space. These buggies are also built to special order with tripping device on the bottom instead of the side, as for some uses this is more convenient.

The Sheffield coke buggy, also shown herewith, is similar in most respects to the ore buggy, except that the carrying box is of much larger capacity, being intended for handling coal or coke. The capacity is 10 bushels, and this load can be handled by a single person. The weight of the buggy is 300 pounds. The automatic lock for the door is so arranged that when tripped the door swings hinged at the top, the load being dumped by the tilting of the car to the necessary angle. When the car is restored to a level position, the door falls into place and automatically locks, so that it is made ready for another load without further attention. Other modifications of these devices are built to suit special conditions. The manufacturers, the Sheffield Car Co, Three Rivers, Mich., have large works and make a special business of building light cars for industrial, railway and contractors' use. Fairbanks, Morse & Co., Chicago, are general sales agents.

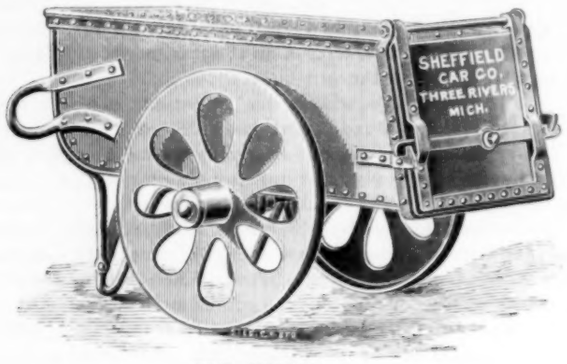
B. & O. Electric Locomotive Order Complete.

The last of the three great electric locomotives for the operation of all trains on the main line of the Baltimore & Ohio Railway, has been shipped from the Schenectady works of the General Electric Co. These locomotives will handle the entire freight and passenger traffic of the B. & O. road passing in and out of Baltimore from the north, through the belt line tunnel which passes under the city and which is the longest soft earth tunnel in the world. Each of these locomotives weighs 96 tons and while almost equal in size to the largest steam locomotive, greatly exceed them in power, each having nearly 1,500 h. p. The first was put into service in August last and the second in December, since which date they have been handling the entire freight traffic of the B. & O through the tunnel without accident of any kind. The arrangement of the controlling levers in the cab has been made as like that of the steam locomotive as possible, and the engineer accustomed to the latter has but to pull a lever to start his electric engine with the same ease as he formerly started his steam locomotive.

In appearance, these great electric machines resemble a large locomotive cab with sloping shield fore and aft. The cab contains the controlling mechanism, and the shields enclose the air compressors and tanks. No limit of speed has yet been reached. Eighty miles an hour has been attained without effort, and the makers say they could as easily make 150 miles an hour as the steam engine makes 60 miles. When the third locomotive reaches Baltimore, the electric engines will undertake the passenger service as well as the freight traffic, and the present coke burning engines used with the passenger trains running through the tunnel will be shut off before entering the tunnel.

Gone Back to Belts after Using Ropes.

The fact that the Warren Mfg. Co., in rebuilding its plant has gone back to belts after a trial of ropes for the main



ORE BUGGY.

transmission, has been not a little commented on by advocates and opponents of rope drives. John Waterman, treasurer of the company, says, in writing to *Power* on the reasons for the change:

"We put belts in our new mill because they require less care than ropes and because we believe there is less loss of power in belts than in ropes. For instance, in the English, or individual rope system there are always ropes of different diameters. In starting, say on a section of ten ropes, the smallest diameter rope would take hold first and if it could do all the driving it would do so, but where taxed beyond its capacity it would slip and the next smallest diameter rope would take hold and so on through the whole section of ten ropes. There is therefore a certain amount of lost power, and much more, we think, than in belts. As to weight, the difference is in favor of belts. There are also more stoppages with rope giving out than there can be with belts. There are also other reasons of less importance why we prefer belts."

THE report that the Tennessee Coal, Iron & Railroad Co. would guarantee $1,000,000 bonds for the proposed basic open-hearth plant at Birmingham is corrected by that company. It is stated that the Southern Railway and the Louisville & Nashville will undoubtedly take about $300,000 of the securities of the new steel plant and the balance, perhaps $700,000 will be taken by private subscription. The financial part of the matter is expected to be concluded very shortly, Mr. J. G. Moore having just returned from Europe.

HAMILTON DISSTON, a member of the well-known firm of Henry Disston & Sons, saw manufacturers, was found dead in bed on April 30, at his residence in Philadelphia. He was born on Aug. 23, 1844.

A GREAT POWER TRANSMISSION PLANT.

The completion, in all its parts, of the scheme of power transmission between Folsom and Sacramento, Cal., is the rounding out of a vast enterprise, undertaken in doubt and terminated in a success which has, as it were, galvanized the State of California. It has demonstrated not only the tremendous resources at the command of that State but also the feasibility of electrical transmission over long distance commercially. A preliminary sketch of the progress of the work was given in this paper some months ago. We now present some illustrations of the completed plant and additional data concerning the enterprise.

The scheme as first conceived by Mr. Livermore, president of the Natona Water & Mining Co. contemplated nothing more than the building of a dam across the American river at Folsom for the storage of water and the irrigation of the lands lying in the Sacramento Valley. For 25 years intermittent efforts were made to carry out the scheme and but little progress was effected. Calculations had also been made looking to the utilization of the power derivable from the difference in level of the water, and estimates had placed the possible power available at Folsom extremely high, while dreams of a huge manufacturing city to utilize this power at that point were indulged in. But the plans turned out differently, and instead of the factories being brought to the power, the power is now taken to the factories.

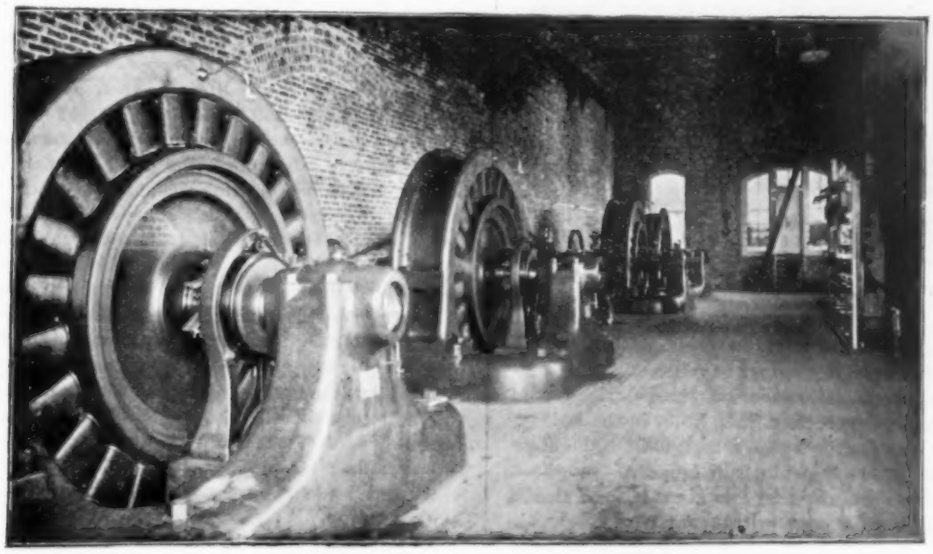


FIG. 1.—DYNAMO ROOM AT FOLSOM.

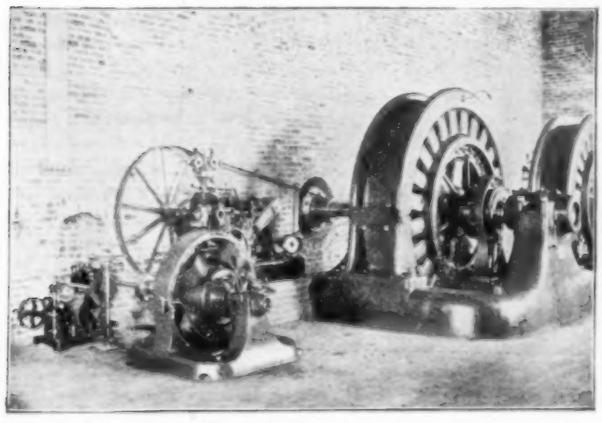


FIG. 2.—EXCITERS AND GOVERNORS IN DYNAMO ROOM AT FOLSOM.

In 1881 the rights of the old company, presided over by Mr. Livermore, were taken over by the Folsom Water Power Co. Work had been begun on the dam, but the development of the scheme appeared so costly that not until the company made a contract with the State of California, whereby convict labor for the construction of the dam and canal, was exchanged for the site of a state prison and a certain amount of power was the work really put under way. In 1888 this contract was signed, the plans were expanded, and work was begun in earnest. The dam is a massive structure of granite laid in Portland cement. It is 650 feet long, 89 feet high in the center, 87 feet wide at the base, 25 feet wide at the crest and contains about 48,590 cubic yards of solid masonry. Normally the dam forms a storage basin or reservoir three and one-half miles long with a capacity of 13,000,000 cubic yards of water.

The canal on the west side intended principally for irrigation, is not yet completed. The east side canal is divided into three sections. The first, stretching as far as the State Canal, where the water falls about seven feet, is cut out of the solid granite and extends 2,000 ft. The second section is 4,000 ft. long and on the completion of this, the terms of the State labor contract were fulfilled. Thus far the canal is built along the face of the cliff. The third section of the canal is an open ditch, excavated by the Folsom Water Power Co., and is 3,000 feet long. The outer wall of sections two and three carries a broad gauge railroad track. The total length of the canal is 9,500 ft. Section 1 is 53 ft. wide on top and 45 on the bottom. Sections 2 and 3 are each 50 feet wide on top and 45 feet on the bottom. The depth is eight feet. All the water passes through the State power house, through Leffel turbine wheels, developing some 800 h. p. used for air compressors, electric lighting and other purposes. Thence the water continues on to the Folsom power house, at the side of which is an immense log basin. Here the jurisdiction of the Folsom Water Power Co., ceases, and that of the Sacramento Electric & Power Co. begins.

FIG. 3.—STEP UP TRANSFORMERS SHOWING AIR BLAST EQUIPMENT AT FOLSOM.

The power house is built on the site of an old placer gold mine where a fall of 55 ft. is available at high water. It is on the west side of the town of Folsom, in a cut about 60 feet deep 100 feet wide and 150 feet long from which a channel 40 feet wide leads down to the river. At the power house the canal makes a sharp turn at right angles and widens out into a forebay, 150 feet long, 100 feet wide and 12 feet deep which forms a settling basin for debris.

The power house is a two-story brick building. The water

wheels are placed in the open air between the forebay and the wall of the structure, through which the turbine shafts pass. To each shaft is coupled a 750 k. w. (100 h. p.) General Electric three phase generator—the largest of this type yet constructed. Each is a 24-pole machine delivering current at 60 cycles 800 volts and running at 300 r. p. m. The exciters are four-pole 500 volt 30 k. w. generators, either one of which is of sufficient capacity to excite the fields of all four generators. From the generators the current passes to the generator switchboard and thence to nine step up transformers in the upper story of the power house. The capacity of each transformer is 250 k. w. They are cooled by an air blast from blowers driven by induction motors. In these transformers the pressure is raised from 800 volts to 11,000 volts and the current passes to the high tension transmission lines carried out of the power house through porcelain lined holes in the wall.

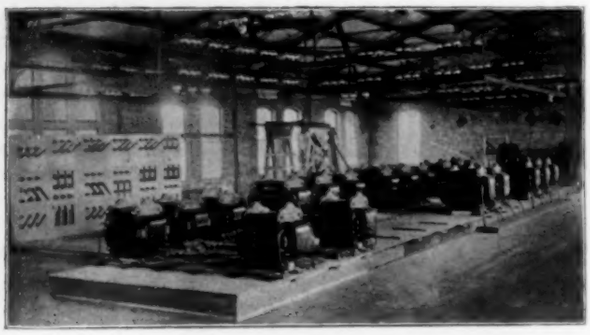


FIG. 4.—STEP DOWN TRANSFORMERS AT SACRAMENTO.

The pole line is double throughout and follows the highroad from Folsom to Sacramento, a distance of 24 miles. Each pole carries two cross arms for two circuits, each circuit consisting of three bare copper wires supported on double petticoated porcelain insulators, especially designed and made for this installation at the porcelain factory of the General Electric Co., at Schenectady. Each insulator before shipment was exposed to a test of not less than 25,000 volts alternating. Each circuit can carry the output of one dynamo and any dynamo can be thrown on any line. The loss is calculated 7.5% when transmitting 3,000 h. p. The telephone line is carried on the same poles as the transmission line and connects the power house with the substation in Sacramento.

The transmission lines being spiralled every mile and the telephone wire transposed every fifth pole, no induction is noticeable on the telephone circuits and conversation is not in any way interfered with.

The substation is a fire-proof two-story brick building on the corner of Sixth and H street, Sacramento, having the transformers on the second floor and the dynamo room on the ground floor. In the transformer room the high tension switchboards receive the terminals of the 10,000 volt lines and operate the different combinations of the step-down transformers. These transformers also ventilated by blowers, vary in size according to the duty required of them, the secondaries delivering current at 125, 500 and 1,000 volts. They number 21, 15 of 125 k. w. and six of 40 k. w.

In the main or dynamo room of the sub-station a line shaft runs the entire length. To this are directly coupled, through friction clutches, three synchronous motors, each of 250 k. w. capacity, wound for a potential of 500 volts and run at a speed of 450 revolutions. To the line shaft are belted one 200 k. w. and one 90 k. w. multipolar G. E. railway generators and two 100 k. w. Edison bipolar machines, all of 500 volts and three 100 light and two 75 light Brush arc machines.

Power was transmitted for the first time from Folsom to Sacramento on July 14, 1895, for the operation of the Sacramento street railway. On September 9 a grand carnival was held to celebrate what is the longest commercial power transmission ever effected. The balance of the machinery has since been set up and the installation is now complete. The power transmitted is now being used for manufacturing purposes as well as for lighting the city and running the street railway. The power is much cheaper than that generated by steam, and the steam engine is fast disappearing from Sacramento factories. Among the establishments now using the power are flour mills, box factories, machine shops and hotels.

The largest consumer is the street railway, which is over 24½ miles of single and 17 miles of double track, operates 32 motor cars and trailers. The Southern Pacific railway shops supply a large number of motors for drawbridges and elevators in freight sheds. The Buffalo Brewing Co., another Sacramento industry, is about to install five non-synchronous motors to replace steam engines, which have been in use for years, and expect to save 40% of the present cost of operation by the change.

FIG 5.—DYNAMO ROOM SUBSTATION AT SACRAMENTO.

The entire equipment was carried out by the General Electric Co., whose apparatus is exclusively employed. The plant is a complete illustration of the possibilities of electric transmission, every problem to be met with in transmitting power over long distances at high potentials and utilizing it having been solved. It is said that the bonds of the Sacramento Electric Light & Power Co. find purchasers at par, although the plant has been in operation less than a year.

East Chicago Foundry Co.'s Ductile Cast Iron.

For more than a year past the East Chicago Foundry Co., of Chicago, has been experimenting at its plant at East Chicago, Ind., with a view to finding some method of making iron castings of a superior quality for especial classes of work, and at last it has succeeded in its efforts. As a result of the investigation made, the company has placed upon the market a spe-

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cialty under the trade name of "Ductile Cast Iron." The metal made by this new process is very soft, but at the same time is exceedingly stiff and strong, making it very serviceable while it is easily worked. It is homogeneous, sound and solid. It is expected by the company that this iron will take the place of drop forgings, and it is claimed to be equal to the best wrought iron—Swedish iron not excepted. In fact, tests have been made showing it to be superior in every way to the best Swedish iron. Shafting, gears and draw-bars made from "Ductile Cast Iron" have been found to be easily worked and of great strength. Tests have been made, showing that a tensile strength of from 60,000 to 80,000 lbs. can be obtained by the process. One test showed a tensile strength of 84,000 pounds.

Numerous tests have been made of this metal, and the reports from different users show excellent results. The iron is also especially adapted for electrical work, on account of its great conductivity. At the office of the company, 716 the Rookery, Chicago, samples of work are shown, which would indicate that the iron is extremely ductile, as its name would indicate. Among the pieces of castings shown is a turning from a shaft, the turning being 45 ft. long, without a break. A very heavy chain is also shown, the links having been cast with a split and welded. Machine castings are exhibited, which have been planed and bored, and the borings threaded, the result showing that this iron possesses in a high degree the qualities necessary for the most excellent machine castings. Several pieces of shafting are also to be seen turned and polished. Among the most interesting exhibits are two gates from castings, one of which was originally 1½ inches round and has been hammered out over 2 ft. long and ⅛ in. thick, without a break or fracture of any kind. Another was one inch round originally, and has been hammered out 20 inches long and 1½ in. square, and then twisted and knotted like a piece of rope, the twisting and knotting being done cold, showing absolutely no sign of fracture or bad results from the severe test to which it was subjected. These castings can be made by the company any weight, from 10 lbs to 10,000 lbs.

It is expected that a large trade will be worked up in "Ductile Cast Iron," and, in fact, several users of wrought iron have been so well pleased with the tests made with these castings that they have substituted them for wrought iron.

CAR and locomotive building as reported by the *Railroad Gazette:* The Lehigh Valley has issued specifications for 25 locomotives. Georgia & Alabama will buy additional engines, probably six. At the Pennsylvania shops in Allegheny six locomotives are being rebuilt. The Central of Georgia will build 200 freight cars. Philadelphia & Reading is building 100 hopper bottom cars and 50 box cars. Florida East Coast will ask bids on 200 box and flat cars. Thirteen passenger coaches are building at the Altoona shops of the Pennsylvania. The B. & O. receivers report that on the 1,000 coal cars on their list the lowest bid was $575 83 per car. Bids were also reported to the court on 25 refrigerator cars, 250 gondolas and 250 box cars.

INDUSTRIAL SUMMARY.

New Buyers in the Market, and Some of Their Wants:—

[If you are in need of machinery of any description, please notify *The Iron Trade Review* and we will put you in communication with our advertisers at once.]

The Rice Machinery Co. has been incorporated at Chicago, with a capital stock of $75,000 to manufacture and sell machinery, by Charles W. Lucas, Charles G. Little, and H. H. C. Miller.

The Jenkins Iron & Tool Mfg. Co. was organized at Bellefonte, Pa., April 27, with these officers: President, Andrew Deitrick, Baltimore; vice-president, James T. Armstrong, Baltimore; secretary and treasurer, F. S. Chapin, Milton; manager, W. R. Jenkins, Bellefonte.

New Construction:—

Ground has been broken at Youngstown, O., for the new oil well supply plant of Geo. B. Sennett.

The Ball-Bearing Car Wheel & Mfg. Co., Cleveland, has increased its capital stock from $50,000 to $125,000. It will erect a four-story brick building, 50x108 feet, and a one-story building of the same dimensions.

The Baltimore & Ohio has recently purchased about 25 acres of land just east of Ellwood City, Pa., the land being necessary to carry out the proposed extension and remodeling of the car shops located there.

The Washburn & Moen Mfg. Co., will rebuild its wire factory recently burned at Worcester, Mass., and build a new addition 248 feet wide in front, 234 feet wide in rear, 119 feet deep and 24 feet high adjoining its present iron works in Quinsigamond village.

The city of Urbana, O., will give the Big Four 55 acres of land and $35,000 in cash to retain the division shops of the road there. Other points had made strong offers to secure the shops. It is expected that work will begin at once on an important extension of the Urbana shops.

Fires and Accidents:—

William F. Remppis's iron works at Reading, Pa., were completely destroyed by fire April 30, causing a loss of about $30,000.

The Denver Mfg. Co.'s brass and lock factory plant at Lakewood, near Denver, Col., was entirely destroyed by fire April 29. Loss over $100,000; insurance trifling.

Additions, Enlargements, Removals, Etc.:—

Wells Brothers & Co., Greenfield, Mass., contemplate building an addition 80x100 feet.

The Midvale foundry at South Allentown, Pa., is to be enlarged by a brick addition, 50x70 feet.

The National Lead Co. has purchased property on River av., Allegheny, 42x227 feet and will enlarge its plant.

The Westinghouse Air Brake Co., of Pittsburg, with works at Wilmerding, Pa., contemplates putting a roof over the open space between its foundry and blacksmith shop buildings

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is an increasingly valuable medium through which to sell equipment to machine shops and foundries.

This will give additional foundry room 50x500 feet, in which will be erected another flask carrier which will increase the output of the foundry from 30 to 40 per cent.

The Union Malleable Iron Co., Moline, Ill., is making arrangements to increase the capacity of its plant about one third.

The Carnegie Steel Co. has been making important acquisitions of land recently, to permit of the additions it is to build at Homestead and Duquesne. At Duquesne the latest purchase includes 57 acres of the Oliver estate. This gives it possession of all the property lying between the Pittsburg, Virginia & Charleston Railroad tracks and the Monongahela river, and the Riverton street bridge and the northern boundary of the town.

General Industrial Notes:—

The Watts Bros. Steel Co. has been incorporated at York, Pa, with $30,000 capital.

Operations have been suspended for repairs at the Monongahela furnaces, McKeesport, Pa.

The small hoop mill of Lindsay & McCutcheon, of Allegheny, Pa., has been started up after five years' idleness. It will make cotton ties, and the output is expected to reach 900 to 1,000 bundles a day.

The Davies & Thomas Co., of Catasauqua, Pa., is arranging for the introduction of overhead electric cranes.

The Clifton Iron Co., of Ironaton, Ala., has let a contract for a number of important improvements to its furnace.

The Arethusa Iron Works, New Castle, Pa., have resumed in the heating and rolling departments, after a three-months' shut-down.

The Cincinnati (O.), Rolling Mill Co. is about to make an extensive improvement, which will enable the concern to manufacture black plate.

The new merchant steel mill of the Illinois Steel Co., at Joliet has been completed and will be operated regularly on all usual sizes of flats, rounds and squares.

The arrangements for the starting of the Peoria Rolling Mill Co.'s works, at Peoria, Ill., have assumed such form that the resumption of operations is expected to take place very soon.

Supt. Thomas Morrison will consolidate the steel works and blast furnace departments at the Edgar Thomson works at Braddock. D. G. Kerr will remain in charge of the furnaces, but the laboratories, time-keeping forces, clerks, under

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1—16x18″ Lathe & Morse Crank Planer.
2—15″ Hendey Shapers.
1—15″ Youngson Shaper.
1—15″ Smith and Mills Shaper.
1—10″x5′ Prentice Engine Lathe.
1 each 14″ and 15″x6′ Ames Engine Lathe.
1—16x5 ft. Bullard Engine Lathe.
1—18x8 ft. L. W. Pond Engine Lathe.
1—24x8 ft. Phillips Engine Lathe.
1—24x14 ft. Lathe & Morse Engine Lathe.
1—38x14 ft. New Haven Engine Lathe.

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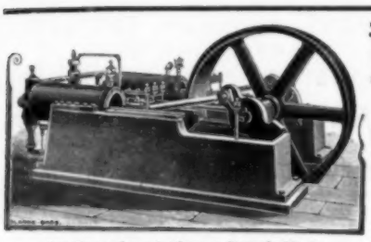

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superintendents and foremen will all be concentrated under one head. The new foundry department is included in the change.

In 24 hours, Wednesday, of last week, the Shenango Valley Steel Co.'s mill turned out 839 tons of billets, exceeding any record it has made and probably exceeding the records of other mills of like capacity.

The Penn Steel Casting & Machine Co. has received an order for 800 tons of steel castings from the Baldwin Locomotive Works for 60 locomotives being built for the Russian government by the Baldwin Works.

The puddling and rolling mills of the Valentine Iron Co., Bellefonte, Pa., are closed for an indefinite time, and many of the employes are seeking other locations. The blast furnace is running steadily on foundry iron.

The Ahrens & Ott Mfg. Co., Louisville, Ky., has resumed operations in all departments and will run above two-thirds its capacity in the iron foundry, the brass foundry, and the enameling department, giving employment to about 400 men.

The Greensboro (N. C.) Furnace Co. has raised the working capital for its mines and furnace, and awaits action on certain railroad freight rate concessions which it is expected to obtain. When these are secured the mines will be worked and the furnace put in blast.

The Sloss Iron & Steel Co. is repairing its No. 4 furnace at North Birmingham, Ala. It is expected that its capacity, when completed, will be as large as that of any of the Southern furnaces. It is being practically rebuilt, and it is thought the work will be finished in about two months.

The Chicago Ship Building Co. had a little trouble with some of its laborers and blacksmiths' helpers last week, the men striking for an advance in wages from $1.25 to $1.50 per day. For a time it was thought a general strike might be the result, but this was averted, and the men were all at work again in a day or two No further trouble is expected.

The machine tool business gives indications of improvement. The Davis & Egan Machine Tool Co., of Cincinnati, is working to its full capacity, and has orders to keep its shops going for months to come. Its business for the past month exceeded that of any one month for several years past, with prospects of a steady increase. Machine shops all over the country are putting in more tools in anticipation of summer and fall trade.

The Bates Thermic Engine Co. has been organized at Phila-

delphia, to build engines for use in the manufacture of fuel gas and for furnishing power through the medium of the gas. Russell Thayer is president of the company, and Allan B. Rorke, John F. Betz, Prof. W. D. Marks, Prof. Houston, Prof. Kennelly and others are connected with it. The engine to be built will embody some novel ideas and produce power direct from fuel, an effective horse power per hour from a pound of coal being obtained. It will make neither smoke nor steam, and will be adapted to either hard or soft coal. Three of these engines are at present in operation in Europe, and five others are in course of construction, including one for M. Farcot, the well known French shipbuilder.

HALF rate to Cleveland and return via Cleveland Terminal & Valley R. R., account M. E. General Conference. Tickets on sale April 29, 30, May 1 and 12, 1886; good going date of sale, good returning within five days including day of sale. Tickets sold on the above dates will be available for further extention of return limit to June 2 inclusive by depositing same with joint agent at Cleveland within the five-day limit. Tickets at the same rate will also be sold on Saturdays, May 9, 16 and 23, good returning to and including the following Monday, giving Saturday, Sunday and Monday of each week at the Conference.

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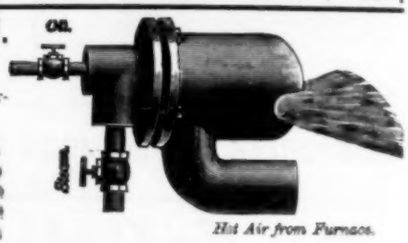

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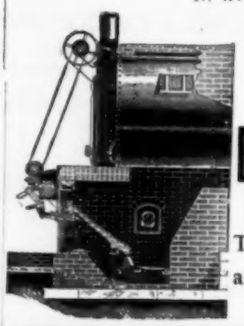

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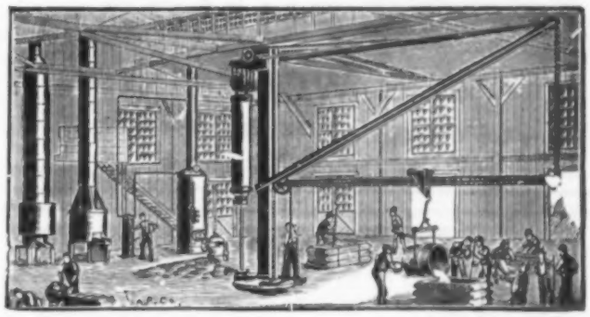

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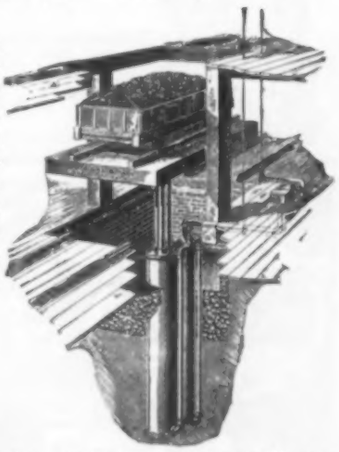
In one of the many mills where Ridgway Cranes are used, one of these cranes, a man and boy both weigh and load 200 tons of rolled iron a day, and this from the ground level up over the sides of high gondolas. The scales are fastened to the crane and weighs as it lifts. Say, what does it cost you to weigh and load your output? And it isn't 200 tons per day either. The Ridgway Crane is a Godsend to every mill and if you but knew it, you can not afford to be without one a single day. At a mere nominal cost we give you a perfect hydraulic system. All you have to do is to attach to your ordinary steam supply and that's all there is of it. No freezing, don't get out of order, requires no attention from one year's end to the other. We have principally shouted this crane at the foundryman, but the rolling mill man and the blast furnace man have been getting them right along and are as enthusiastic over them as anybody.



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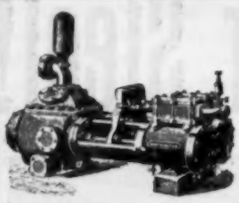

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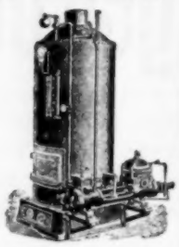

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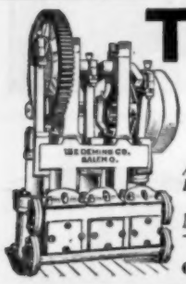

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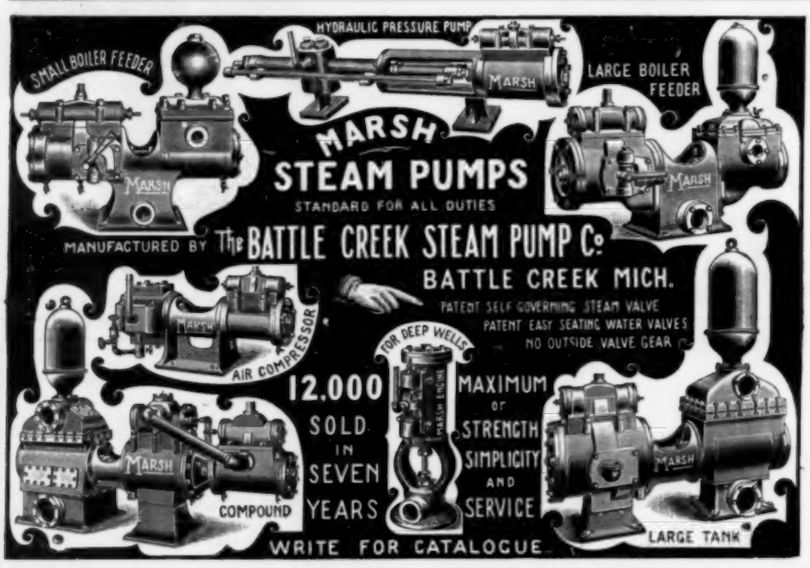

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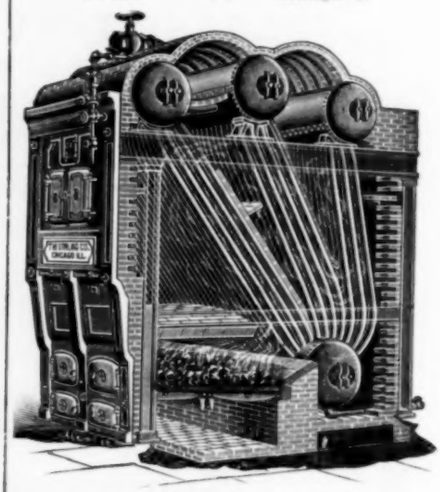

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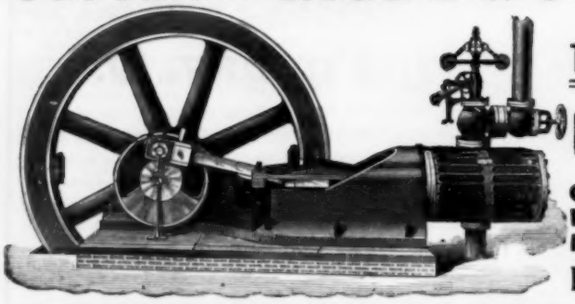

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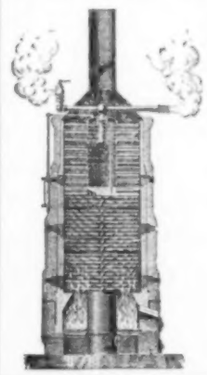

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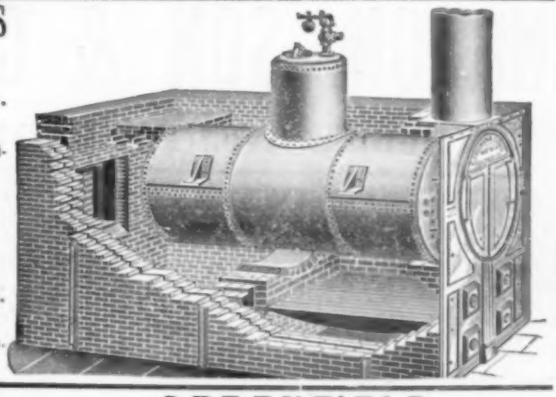

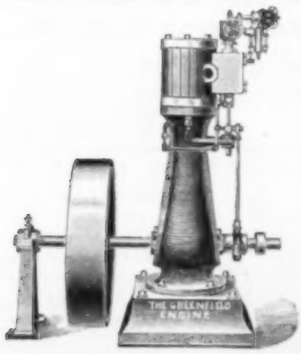

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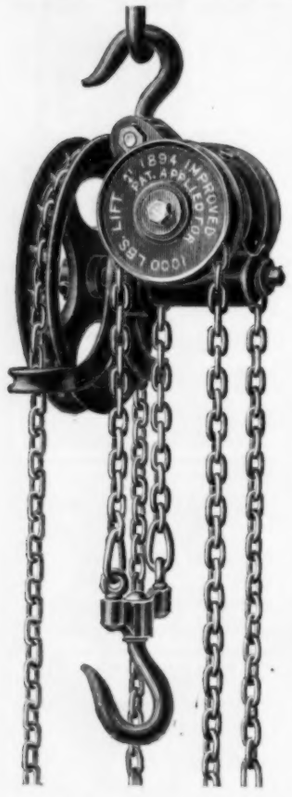

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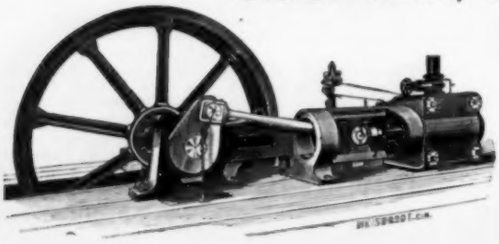

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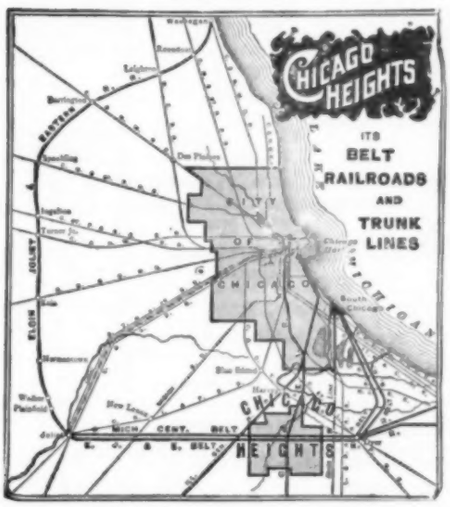

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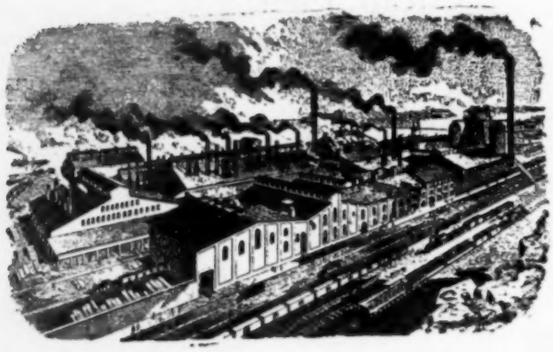

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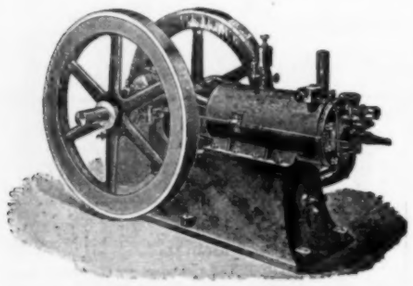

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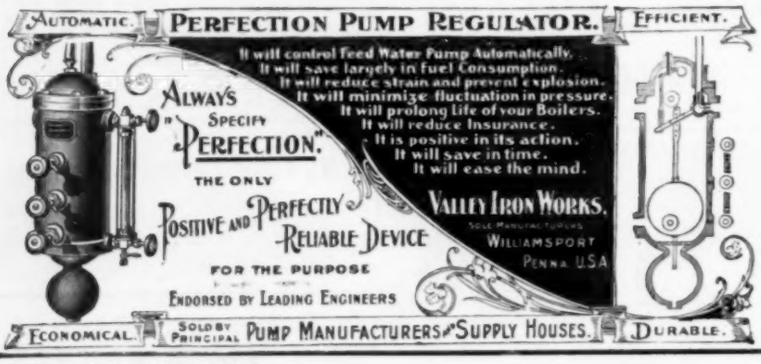
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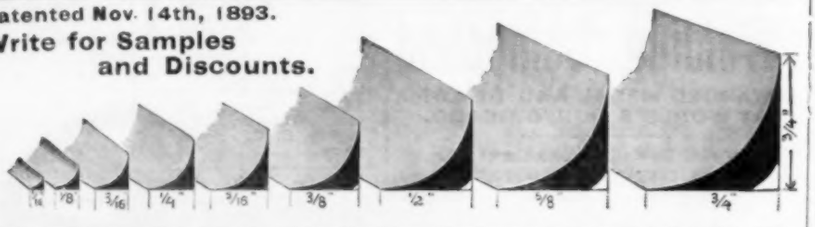

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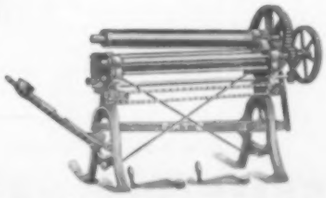

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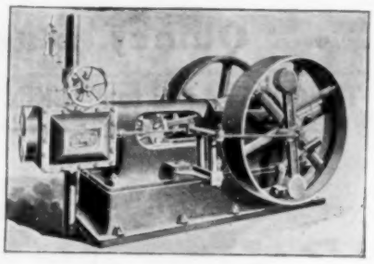

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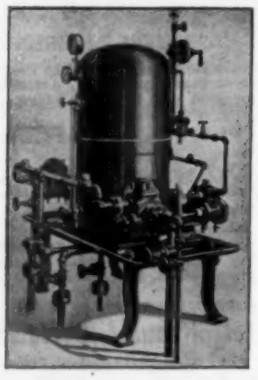

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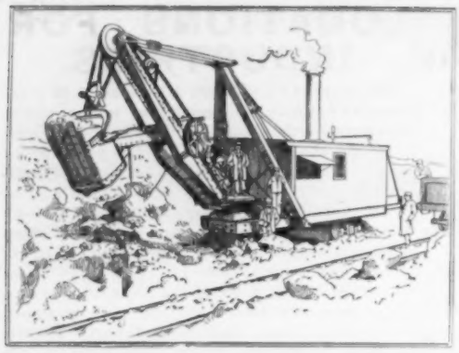

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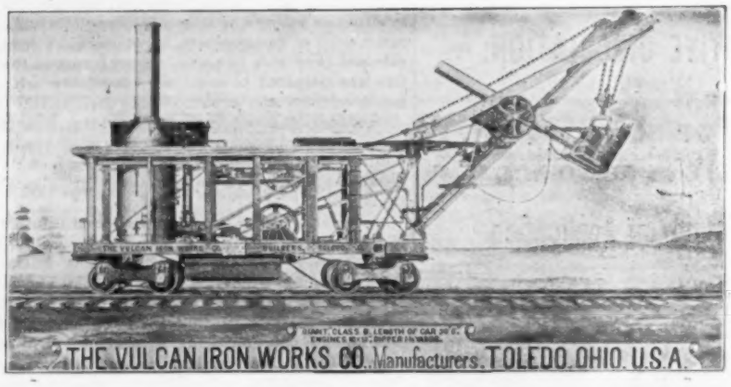

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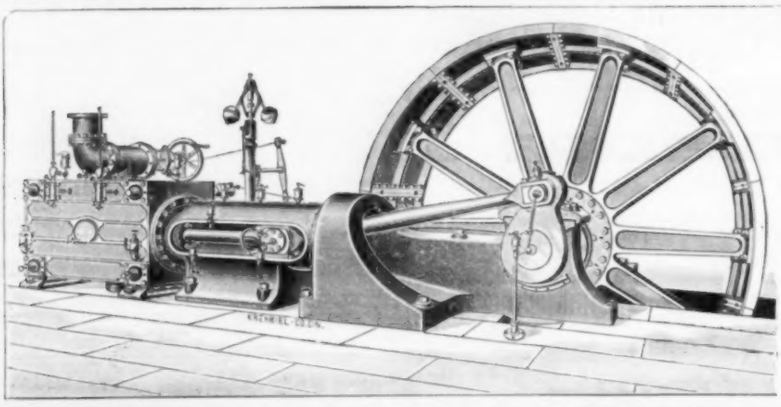

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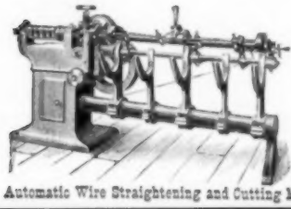

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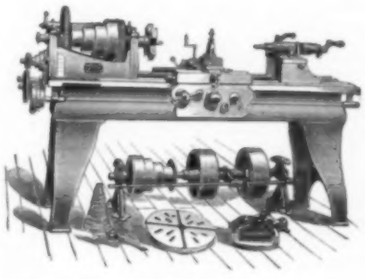

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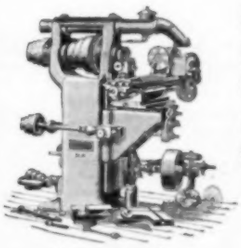

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C. H. Besly & Co., Chicago, Ill.
U. Baird Machinery Co., Pittsburg, Pa.

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Toledo Tool & Machine Co., Toledo, O.
Cady Mfg. Co., Cleveland, O.
Bertsch & Co., Cambridge City, Ind.
C. H. Besly & Co., Chicago, Ill.

Dredges—
Vulcan Iron Works Co., Toledo, O.
American Blower Co., Detroit, Mich.

Dry Kilns—
American Blower Co., Detro t, Mich.
Buffalo Forge Co,, Buffalo, N. Y.

Dynamos—
Westinghouse Electric & Mfg. Co., Pittsburg.
J. H. McEwen, New York City.
Franklin Electric Co., Miamisburg, O.
Star Dynamo Co., Detroit, Mich.
General Electric Co., Schenectady, N. Y.

Eave Troughs and Conductors—
Berger Mfg. Co., Canton, O.
The Cincinnati Corrugating Co., Piqua, O.

Electrical Supplies—
Westinghouse Electric & Mfg. Co , Pittsburg
Franklin Electric Co., Miamisburg, O.
Star Dynamo Co., Detroit, Mich.
General Electric Co., Schenectady, N. Y.

Elevators—
Roberts Steel Chain Belting Co., Pittsburg.

Elevating and Conveying Machinery—
Roberts Steel Chain Belting Co., Pittsburg.

Emery and Corundum Wheels—
J. Wendell Cole, Columbus and Chicago.
Sterling Emery Wheel Mfg. Co., Tiffin, O.

Emery Wheel Machinery—
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C. H. Besly & Co., Chicago, Ill.
Sterling Emery Wheel Mfg. Co., Tiffin, O.
Diamond Machine Co., Providence, R. I.

Engineers and Contractors—
Potter & Hollis Engineering Co., Chicago, Ill.
Robert W. Hunt & Co., Chicago, Ill.

Engineers' Supplies—
C. H. Besly & Co., Chicago, Ill.
H. Channon Co., Chicago, Ill.
Jenkins Bros., New York City.

Engineers' Specialties—
Empire Boiler Cleaning Co., New York City.

Engravers and Electrotypers—
National Engraving Co., Cleveland.
Cleveland Electrotype Co., Cleveland, O.

Engines (Gas)—
Otto Gas Engine Works, Philadelphia, Pa.
Newell Bros., Cleveland, O.
Lambert Gas & Gasoline Engine Co., Indianapolis, Ind.
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Miller Gas Engine Co., Springfield, O.

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Totten & Hogg I. & S. F'dry Co., Pittsburg, Pa
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The Edward P. Allis Co,, Milwaukee, Wis.
The Hooven, Owens & Rentschler Co.
American Hoist & Derrick Co., St. Paul, Minn.
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Valley Iron Works, Williamsport, Pa.
American Blower Co., Detroit, Mich.
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Buffalo Forge Co., Buffalo, N. Y.
Fraser & Chalmers, Chicago.
Lane & Bodley, Cincinnati, O.

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C. H. Besly & Co., Chicago, Ill.

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Stowe, Fuller & Co., Cleveland, O.
Dover Fire Brick Co., Cleveland.
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Semet-Solvay Co., Syracuse, N. Y.

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Morton Tin Plate Co., Cambridge, O.
The Cincinnati Corrugating Co., Piqua, O.

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Otto Goetze, New York City.

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Saws—
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Scrap Iron & Steel—
Klein & Cohn, Cincinnati, O.

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Illinois Screw Co., Chicago, Ill.
C. H. Besly & Co., Chicago, Ill.
Upson Nut Co., Cleveland, O

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Prentiss Tool & Supply Co., Chicago, Ill.

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McDowell Steel Co., Chicago, Ill.

Shapers—
Springfield Machine Tool Co., Springfield, O.

Shafting—
Finished Steel Co., Youngstown, O.

Shearing and Punching Machinery—
Bertsch & Co., Cambridge City, Ind.
Toledo Machine & Tool Co., Toledo, O.
Cady Mfg. Co., Cleveland, O.
Long & Allstatter Co., Hamilton, O.

Sheet Iron—
Cleveland Rolling Mill Co., Cleveland.
Berger Bros., Philadelphia, Pa.
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Smoke Consumers—
American Smokeless Furnace Co., Cleveland, O.
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Trauslucent Fabric Co., Quincy, Mass.

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Steam Boiler Inspectors—
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Steel Castings—
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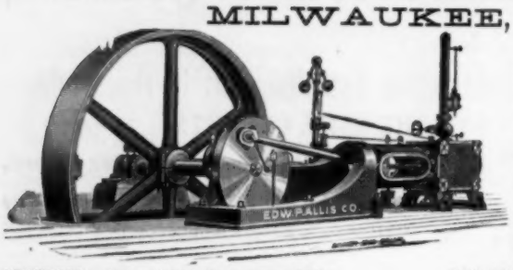

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Marine Iron Works	20
Marion Steam Shovel Co.	39
McDowell Steel Co.	39
McEwen Mfg. Co.	28
McNaull & Co.	22
Michigan Mining School	38
Miller Gas Engine Co.	19
Mitchill, Cornelius S.	25
Monarch Cycle Mfg. Co.	26
Morton Tin Plate Co.	23
Moyes, L. M.	37
Moore Mfg. & Foundry Co.	1
*Nanz & Co.	—
National Engraving Co.	26
Newell Bros.	1
Newhall & Co.	28
Norman Co., J. J.	26
North American Metaline Co.	40
Oglebay, Norton & Co.	23
Ohio Sand Co.	40
Otto Gas Engine Co.	35
Pittman, C. K.	2
Pittsburg Steel & Iron Mfg. Co.	26
Pollock, Wm. B. & Co.	2
Playford Stoker Co.	25
Pope, E. C.	23
Potter & Hollis Foundry Co.	19
Prentiss Tool & Supply Co.	31
Q. & C. Co	40
Rand Drill Co.	2
Rippel Mfg. Co.	1
Reese, Hammond & Co.	40
Roberts Steel Chain Belting Co.	36
Rockwell & Co, W. S.	28
Salem Wire Nail Co.	38
Semet-Solvay Co.	28
‖Sharon Fire Brick Works	—
Sharpless & Winchell	40
†Shaw Electric Crane Co.	—
Shiffler Bridge Co.	37
Skinner Chuck Co.	24
Southwark Foundry & Machine Co.	23
Springfield Machine Tool Co.	40
Standard Paint Co.	39
Star Dynamo Co.	35
Starrett Co.	1
Sterling Emery Wheel Mfg. Co.	31
Stirling Co.	22
Stevens, F. B.	40
Stilwell-Bierce & Smith-Vaile Co.	2
Stowe, Fuller & Co.	18
Stuart Fire Brick Co.	37
Sturtevant Co., B. F.	2
Sykes Iron Roofing Co.	24
Taylor & Boggis Foundry Co.	1
Textor, O.	2
Thurman Fuel Oil Burner Co.	20
Tod, Wm. & Co.	38
Toledo Machine & Tool Co.	39
Totten & Hogg I. & S. F'dry Co.	22
Trethewey & Co	26
Translucent Fabric Co.	27
Union Mining Co.	18
Universal Telephone Co.	1
Upson Nut Co.	1–20
Valley Iron Works	26
*Vulcan Iron Works, Toledo	30
Wickes Bros.	2
†Ward & Nash	—
Westinghouse Electric & Mfg. Co.	33
Westmoreland Fire Brick Co.	35
Worthington, Henry R.	22
Wright Co.	31
Young, J. D.	20

IRON AND STEEL MARKETS.

IRON ORE.

[On Lake Erie docks.]

No. 1 Specular, Bessemer	$4.50@4.75
No. 1 Bessemer hematite	4.00@4.25
Hematites No. 1 non-Bessemer	2.25@2.75
No 1. Specular, non-Bessemer	2.75@3.25

PIG IRON.

CLEVELAND (f. o. b. cars):	
Bessemer	$13 25@13 50
No. 1 Strong Foundry	12 75@13 00
No. 2 Strong Foundry	12 00@12 50
No. 1 Gray Forge, red short	11 25@11 50
No. 2 Gray Forge, neutral	10 75@11 00
No. 1 American Scotch	13 00@13 25
No. 2 American Scotch	12 25@12 50
Lake Superior Charcoal	13 50
PITTSBURG:	
No. 1 Foundry	$12 75@13 25
No. 2 Foundry	12 00@12 25
Gray Forge	11 00@11 25
White and Mottled	10 25
Warm Blast Charcoal	15 00@16 00
Cold Blast Charcoal	22 00
Bessemer	13 25@13 50
CHICAGO (reported by our representative:)	
Lake Superior Charcoal	$13 50@$14 00
Local Coke Foundry No. 1	12 25@12 50
Local Coke Foundry No. 2	11 75@12 00
Local Coke Foundry No. 3	11 00@11 50
Local Scotch Foundry No. 1	12 25@12 50
Local Scotch Foundry No. 2	11 75@12 00
Local Scotch Foundry No. 3	11 00@11 50
Southern Coke No. 1	12 10@12 35
Southern Coke No. 2	11 60@11 85
Southern Coke No. 3	11 10@11 60
Southern No. 1 Soft	11 60@11 85
Southern No. 2 Soft	11 35@11 50
Southern Silveries No. 1	11 85@12 35
Southern Silveries No. 2	11 60@11 85
Jackson Co. Silveries	14 50@16 00
Ohio Silveries No. 1	15 00@15 50
Ohio Silveries No. 2	14 50@15 00
Ohio Strong Softeners	15 00@15 50
Alabama Car Wheel	16 85@17 35
Malleable Bessemer	13 25@13 50
Coke Bessemer	13 00@14 00
CINCINNATI (reported by Rogers, Brown & Co.)	
Southern Coke No. 1, Foundry	$10 75@$11 25
Southern Coke No. 2 and No. 1 Soft	10 25@10 50
Hanging Rock Coke, No 1	12 50@13 50
Hanging Rock Charcoal No. 1, Fdy	16 00@17 00
Tennessee Charcoal No 1	13 00@14 00
Jackson County Silvery No 1	14 00@14 50
Southern Coke, Gray Forge	9 25@9 50
" " Mottled	9 00@9 25
Standard Alabama Car Wheel	15 00@16 00
Tennessee " "	14 00@15 00
Lake Superior " "	15 00@15 50
BUFFALO:	
No. 1 Foundry Strong Coke Iron Lake Superior Ore	$13 00@13 25
No. 2 Foundry Strong Coke Iron Lake Superior Ore	12 50@12 75
Ohio Strong Softener No. 1	13 00@13 50
Jackson Co. Silvery No. 1	15 25@15 50
Lake Superior Charcoal	13 50@14 00
Southern Soft No. 1	12 15
Hanging Rock Charcoal	17 00
ST. LOUIS (reported by Rogers, Brown & Meacham):	
Southern Coke No 1	$...@$11 50
Southern Coke No. 2	11 00
Southern Coke No. 3	10 50
Southern Gray Forge	10 00
Southern Charcoal No. 1	15 00
Missouri Charcoal No. 1	14 00@15 00
Ohio Softeners	16 00
Lake Superior Car Wheel	15 00
Southern Car Wheel	16 25

OLD RAILS AND SCRAP METAL.

	GROSS TONS
Old iron rails	$16 50
Old steel rails	12 50
Old car wheels	13 00
	NET TONS
No. 1 R. R. wrought scrap	$12 75
Mill scrap	10 00
No. 1 Machine cast scrap	10 00
Iron axles	17 50
Axle turnings	9 00
Wrought turnings (free from cast)	8 00
Cast borings	7 00
Uncut wrought iron boilers	4 00
Steel boiler plates	10 00
Grate bars	6 75
Pipes and flues (clean)	10 00
Tank iron	10 00
Hoop and band iron	7 00
Sheet iron	6 50
Wrought drillings	7 50
Malleable iron	10 00

STRUCTURAL MATERIAL.

Beams and Channels (Cleveland mill)	1.54c
Angles	1.34c@1.39c
Tees	1.49c
Universal Plates	1.45c
Sheared Plates	1.50c

MERCHANT IRON AND STEEL.

[List prices out of store.]

Flat Bar.

1½ to 4 by ⅜ to 1 inch	1 30
4½ to 6 by ⅜ to 1 inch	1 35
1½ to 6 by 1⅛ to 2 inch	1 35
1½ & 1¾ by ⅜ to ¾ inch	1 20
1 & 1⅛ by ⅜ to ¾ inch	1 20
⅝, ¾, ⅞, by ⅜ to ⅝ inch	1 20

Frank P. Cady, Pres. and Supt.
Geo. H. Bowler, Sec'y and Treas.

THE CADY MFG. CO.

18, 20 and 22 Johnson St., CLEVELAND, O.

SEND FOR OUR NEW CATALOGUE OF Power Presses, Drop Hammers, Punches and Shears, Wire Working and Special Machinery.

PERFORATED METALS

OF ALL KINDS FOR

MILLING MINING AND AGRICULTURAL MACHINERY,

PERFORATED IRON, STEEL, COPPER, BRASS, TIN, ZINC, LEAD, ETC., TO ORDER.

LARGE AND VARIED ASSORTMENT OF SIZES. CORRESPONDENCE SOLICITED.

THE ROBERT AITCHISON. PERFORATED METAL CO.,

OFFICE, ROOM 510 265 TO 269 DEARBORN STREET, CHICAGO, ILL. WORKS SOUTH CHICAGO.

A. H. LEITCH, PREST. JOHN C. LEITCH, SEC. AND TREAS

WESTMORELAND FIRE BRICK CO.

MANUFACTURERS OF HIGH GRADE **FIRE BRICKS.**

PITTSBURG, PA.

Works and Mines, Westmoreland, Pa.

DIXON'S GRAPHITE PAINT

FOR TIN OR SHINGLE ROOFS AND IRON WORK. IT IS ABSOLUTELY WITHOUT AN EQUAL. Tin roofs well painted have not required repainting for 10 to 15 years.

If you need any paint it will pay you to send for circular.

JOSEPH DIXON CRUCIBLE CO., Jersey City, N. J.

SMALL DYNAMOS

For Incandescent Lighting,

In Factories, Mills, etc., at a Reasonable Price.

If you have power put in your own lighting plant. Write for our Catalogue.

STAR DYNAMO CO., Jefferson City, Mo.

POWER From **GAS OR GASOLINE.**

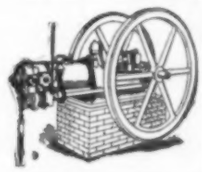
No Steam, Coal, Ash, Gauges, Engineer nor Danger.

From 1 to 250 horse-power. } **Can be Used in City or Country.**

THE OTTO GAS ENGINE WORKS, Inc.

33d and Walnut Sts., PHILADELPHIA, PA.

S. M. York, 42 S. Water St., Cleveland Agent. Over 45,000 Sold.



IRON CLAD PAINT CO.

Factory, 75 & 77 Central Way. Sec. & Treas., No. 3 Case Build'g.

CLEVELAND OHIO.

Trade Mark Patented.

ORDER DIRECT FROM THE **Iron Clad Paint Co.**

And get the genuine article, and save liability of suit for using an article made in violation of the patents issued to Wm. Green, and now owned by this Company.

IRON CLAD PAINT is the most durable, most fire-proof and Cheapest Paint made.

FURNISHED both Dry and Ground in Oil

USED BY NEARLY ALL THE RAILROADS.

Round and Square.

1 to 1⅜ inch	1 10
2 to 2⅜ inch	1 30
2⅜ to 3¼ inch	1 25
3⅜ to 4 inch	1 60
4¼ to 4½ inch	2 20
4¾ to 5 inch	2 40

Oval.

⅜ to 1¼ inch	1 30
⅓ to ¾ inch	1 30
½	1 50
⅝	1 70

Half Oval and Half Round.

1½ to 3 inch	1 65
⅜ to 1¼ inch	1 45
⅓ to ¾ inch	1 70
½	1 85
⅝	2 90

Heavy Band.

1¼ to 6 by ¼ and 5-16 inch	1 20
1 to 1⅜ by ¼ and 5-16 inch	1 25
¼ to ⅜ by ¼ and 5-16 inch	1 35
½ to ⅝ by ¼ and 5-16 inch	1 60

Hoop Iron.

1 7-16 to 4, No. 13, 14, 15 and 16	1 35
1 7-16 to 2, No. 17, 18 and 19	1 40
1 7-16 to 2, No. 20	1 50
1 7-16 to 2, No. 21	1 60
1 7-16 to 2, No. 22	1 70
1⅛ to 1⅜, No. 13, 14 and 15	1 40
1⅛ to 1⅜, No. 16, 17 and 18	1 45
1⅛ to 1⅜, No 19 and 20	1 50
1⅛ to 1⅜, No. 21	1 60
1⅛ to 1⅜, No. 22	1 70
15-16 and 1 inch, No. 13, 14 and 15	1 35
15-16 and 1 inch, No. 16, 17 and 18	1 50
15-16 and 1 inch, No. 19 and 20	1 60
15-16 and 1 inch, No. 21	1 70
15-16 and 1 inch, No. 22	1 80
⅞, No. 13, 14 and 15	1 60
⅞, No. 16, 17 and 18	1 70
⅞, No. 19 and 20	1 80
⅞, No. 21	1 90
⅞, No. 22	2 00
13-16, No. 13, 14 and 15	1 70
13-16, No. 16, 17 and 18	1 80
13-16, No. 19 and 20	1 90
13-16, No. 21	2 00
13-16, No. 22	2 10
¾, No. 13, 14 and 15	1 80
¾, No. 16, 17 and 18	1 95
¾, No. 19 and 20	2 05
¾, No. 21	2 15
¾, No. 22	2 25
11-16, No. 13, 14 and 15	2 05
11-16, No. 16, 17 and 18	2 10
11-16, No. 19 and 20	2 20
1-16, No. 21	2 30
11-16, No. 22	2 40
11-16, No. 23	2 50
⅝, No. 13, and 15	2 10
⅝, No. 16, 17 and 18	2 20
⅝, No. 19 and 20	2 30
⅝, No. 21	2 40
⅝, No. 22	2 50
⅝, No. 23	2 60
9-16, No. 13, 14 and 15	2 30
9-16, No. 16, 17 and 18	2 40
9-16, No. and 20	3 50
9-16, No. and	1 60
9-16, No. 221	2 70
9-16, No. 22	1 80
7-16 ad ½ inch, No. 13, 14 and 15	3 50
7-16 and ½ inch, No. 16, 17 and 18	2 60
7-16 and ½ inch, No. 19 and 20	2 70
7-16 and ½ inch, No. 21	2 80
7-16 and ½ inch, No. 22	2 90
7-16 and ½ inch, No. 23	3 00
⅜, No. 13, 14 and 15	3 00
⅜, No. 16, 17 and 18	3 10
⅜, No. 19 and 20	3 20
⅜, No. 21	4 50
⅜, No. 22	3 00
⅜, No. 23	3 75

Light Band.

1⅜ to 6 by ¼ to 3-16 inch	1 60
1½ to 6 by Nos. 11 and 12	1 65
1 to 1¾ by ¼ to 3-16 inch	1 65
1 to 1¾ by Nos. 11 and 12	1 70
⅝ and 13-16 by ⅛ to 3-16 inch	1 81
⅝ and 13-16 by Nos. 11 and 12	1 75
⅝ and 11-16 by ⅛ to 3-16 inch	1 90
⅝ and 11-16 by Nos. 11 and 12	1 95
⅝ and 9-16 by ⅛ to 3-16 inch	2 05
⅝ and 9-16 by Nos. 11 and 12	2 10
½ by ⅛ to 3-16 inch	2 20
½ by Nos. 11 and 12	2 25

Wagon Box Iron.

⅝ inch, beveled edge, by Nos. 11 and 12	1 50
⅝ inch, " " " " 13 and 14	1 60
¾ inch, " " " " 11 and 12	1 65
¾ inch, " " " " 13 and 14	1 75

Sheet Iron.

No. 10	1 45
No. 12	1 55
No. 14	1 65
No. 15-17	1 75
No. 18	1 90
No. 20	2 05
No. 22-24	2 15
No. 25.26	2 25
No. 27	2 35

Steel Boiler Plates—1-4 in. and Heavier.

Tank	1 45
Shell	1 60
Flange	1 70
Marine Flange	2 00
Fire Box	2 50

Above includes plates 90 inches wide.

90 to 96 in. wide	½c. lb. extra
96 to 100 in. wide	1 c. "
100 to 104 in. wide	1½c. "
104 to 106 in. wide	special

American Cast Tool Steel.

ROUND, SQUARE AND OCTAGON.	cts. lbs.
1 to 2 in. inclusive	08
9-16 to ⅞ in. "	08

ÆTNA-STANDARD IRON AND STEEL COMPANY,

BRIDGEPORT, OHIO,

MANUFACTURERS OF

TIN AND TERNE PLATE, Iron and Steel Plates and Sheets, Plain Black, Painted, Corrugated and other forms of ROOFING, SIDING and CEILING. Patent Leveled Galvanized Sheets, BARS, Light Section Rails, ANGLES, Tees, Channels, and other Miscellaneous Bars and SHAPES.

WITH SUCH DIVERSITY OF PRODUCT,

SPECIAL ADVANTAGES are offered buyers of mixed lots, effecting saving in freight charges and by reason of our LARGE STOCKS, securing **PROMPT SHIPMENT.**

INQUIRIES INVITED AND CATALOGUES MAILED ON APPLICATION.

ROBERTS STEEL CHAIN BELTING CO., Pittsburg, Pa.

Elevating and Conveying Machinery

For Handling all kinds of materials.

Special Wrought and Steel Chains of every description; Coil and Cable Chains; Chain Haulages for Coal Mines; Sprocket Wheels; Complete Coal and Ashes Handling Plants; Wire Rope Haulages and Wire Rope.

W. H. COFFMAN COKE CO.

BLUEFIELD, W. VA.

GENERAL FACTORS AND SHIPPERS OF

POCAHONTAS FLAT-TOP COKE.

So low in ash that it requires no fluxing for foundry purposes. Our foundry and furnace coke was awarded the first premium at the World's Fair in 1893.

AVERAGE ANALYSIS OF COKE.

Moisture	00.196	Sulphur	00.677
Fixed Carbon	93.625	Ash	05.004
Volatile Matter	00.494		

Foundry, Furnace and all sizes of crushed coke. Guaranteed lower in Sulphur than any other commercial coke

STEEL CASTINGS

FROM 10 LBS. UPWARD.

Made from Best Open-Hearth Steel.

ALSO SAND ROLLS AND CAST-IRON PINIONS.

SEND FOR ESTIMATES.

THE JOHNSON COMPANY, Johnstown, Pa.

GARDEN CITY FOUNDRY CO.

INCORPORATED.

Successors to TURNER, DICKINSON & CO.

Armitage and Central Avenues, Station G, Chicago, Ill.

FRICTION CLUTCHES, HANGERS, PILLOW BLOCKS & PULLEYS.

Large Stocks on Hand. Shipments Promptly Made.

. . '96 JENKINS '96 . .

Is the Perfection of Joint Packing. Instantaneous. Does not Squeeze Out and not Necessary to follow up Joint. We guarantee it to last for years on any and all pressures of steam or any kind of joint where packing is required. Does not Rot, Burn or Blow Out, therefore the best for all purposes. Call for and insist on having '96 JENKINS '96 stamped like cut.

Jenkins Bros., New York, Boston, Philadelphia, Chicago.

7-16 to ⅝ and 2⅜ to 3 in.	.09
3⅛ to 4 in.	.09½
⅝ to 11-16 and 4⅛	.10
⅝ to 6 in.	.10¾
¾ to 9-32 and 6¼ to 7 in.	.11
7 in	.13

Flats.

	cts. lbs
2 to 9-16 in. wide by 2 to ⅝ thick	.8

Bessemer and O. H. Steel.

Bessemer Machinery	base price,	1 50
Open-hearth Tire	"	1 80
Open-hearth Spring	"	2 20
Sleigh Shoe	"	1 90
Toe Calk	"	2 10
Cutter Shoes, tapered and bent	"	2 20

English Tool Steel.

Jessop's	15½c
Hobson's "Best"	15½c
" "Choice"	35c

Burden Boiler Rivets.

⅛, ⅜, 11-16 and ¾ inches diameter	3 30
Bridge ⅛, ⅜, 11-16 and ¾ inch diam.	3 00

Wrought Pipe and Boiler Tubes.

Lap weld black, base	dis. 65
Butt " " "	dis.
Lap " galv. "	dis. 52½
Butt " " "	dis. 50
Boiler tubes 2¼" and smaller	dis. 62½
Boiler tubes 2½" and larger	dis. 65
Casing screw and socket joint	dis. 52½
Casing inserted joint	dis. 47½

MACHINERY SUPPLY MARKET.

Anvils.

American	₩ lb 9@10
Wright's	₩ lb 12

Bellows.

Blacksmiths'	Hill's	dis 40
	Bullock's	dis 50&10
Moulders'		dis 40@40&10
Hand		dis 40&10@50

Belting.

Boston Belting Co.'s standard	dis 70
" " " extra	dis 60&5
" " " best	dis 55
Cleveland Rubber Co. extra standard	dis 60&10
Hoyt's Short Lap	dis 45
Shultz Raw Hide Leather Belting, single	dis 40
Munson's Short Lap Single Leather	dis 50
Munson's Short Lap Double and Light Double Leather	dis 50&10
Shultz Raw Hide Leather Belting, Double and Light Double	dis 40
Standard, oak tanned	dis 50&10
Alexander Brothers' pure oak tanned	dis

Blowers and Exhausters.

B. F. Sturtevant's	dis 20
Boston Blower Co.	dis 35

Chucks.

Cushman's 4 Jaw Independent	dis 45
" Combination	dis 40
" Geared Scroll	dis 30
" 2 Jaw Brass Workers	dis 30
" Drill	dis 35
Wescott's Scroll Combination	dis 33⅓
" Independent	dis 40
" Little Giant Drill	dis
Horton's Universal	dis
" Independent	dis 45
Whiton's Independent	dis 45
National Combination	dis 40
Sweetland "	dis 40
Almond Drill	dis 20
Morse "	dis 15
Skinner's Combination Lathe	dis 40&10
" Independent Lathe	dis 40&10
" Universal Lathe	dis 40&10
" Drill	dis 30

Cutters and Reamers.

Cleveland	dis 10@15
Pratt & Whitney	dis 10@15
Standard	dis 10@15
Morse	dis 15
Brown & Sharpe, Milling Cutters	dis
" " Gear Cutters	dis

Crowbars.

Cast Steel	₩ 3½
Iron, steel points	₩ lb 3

Drill and Drill Sockets.

Twist Drills	dis 50&10
Morse Taper and Straight Shank to 1½"	dis 50&10
Morse Taper and Straight Shank Larger than 1½"	dis 25
Drill Sockets	dis 25
Standard Twist Drills	dis 55@55&5
Cleveland " "	dis 55@55&5

SHIFFLER BRIDGE COMPANY,

BUILDING DEPARTMENT.

SPECIALTIES: STEEL AND IRON BUILDINGS FOR ROLLING-MILLS TIN PLATE PLANTS, STEEL WORKS, FOUNDRIES, FACTORIES, ROOF TRUSSES, GIRDERS, COLUMNS, BEAMS, CORRUGATED IRON, ETC.

Main Office and Works:
48th Street and A. V. Ry.
PITTSBURG, PA.

Branch Offices:
1123 Betz Building, Philadelphia, Pa.
65 Dexter Building, Chicago, Ill.
228 Lumber Exchange, Minneapolis, Minn.

CAMBRIA STEEL.

Steel Rails, Blooms, Billets, Bars, Axles, Angles, Channels, Forgings, Locomotive Car and Structural Steel.

CAMBRIA IRON COMPANY, S. W. Cor. 15th and Market Sts., opp. Penna. R. R. Station, Philadelphia; Chicago office, Western Union Building; New York office, (for Rails and Axles), 33 Wall St.; Cleveland office, Bourne, Fuller & Co. Works at Johnstown, Pa.

GAUTIER STEEL DEPARTMENT OF CAMBRIA IRON CO.,

JOHNSTOWN, PA.

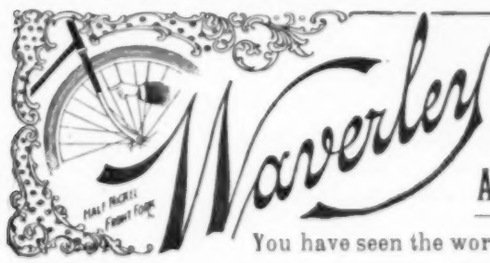
MERCHANT BAR STEEL: Including Tire, Toe Calk, Machinery, Carriage Spring, Railroad Spring, Hoe, Rake, Fork, etc.
AGRICULTURAL STEEL AND SHAPES: Finger Bars, Knife Backs, Rake Teeth, Bundle Carrier Teeth, Tedder Forks and Springs, Spring Harrow Teeth, Harrow (Drag) Teeth, Seat Springs, etc.
PLOW STEEL: Flat and Finished Plow Shapes, Digger Blades, Slabs (Penn and Percot), Hammered Lay, Rolled Lay, etc.

Cold Rolled Steel Shafting. **Steel Harrow Discs.** **Cambria Link Barb Wire.**

New York Office, 102 Chambers St. | Philadelphia Office, 611 Phila. Bourse. | Chicago Office, 209 Western Union Bldg. | Atlanta Office, 325 Decatur st.

STUART FIRE BRICK CO.
MANUFACTURERS OF
Silica Brick
For Open-Hearth, Basic and Acid Steel Furnaces, Glass and Copper Tank Furnaces. Extra Shapes MADE TO ORDER.
Office, Room 21, Conestoga Bldg., Cor. Wood and Water Sts., PITTSBURG, PA.

COMBINE SAFETY WATER TUBE BOILER
L. M. MOYES, MANUFACTURER, PHILADELPHIA, PA.



A POINTER TO DEALERS.

You have seen the words at the top of this ad. so often that they are engraved upon your mind. They are likewise engraved upon the mind of almost every individual who can read. When a person thinks of bicycles the first thing that flashes upon the mind is Waverley and that is the first wheel asked for. Do you realize the importance of being able to supply what a prospective buyer wants? Just consider it for a few moments, and then write us for terms.

INDIANA BICYCLE CO., **INDIANAPOLIS, IND.**
EASTERN DISTRIBUTING BRANCH,
339 BROADWAY, NEW YORK.

Emery.

	No. 4 to No. 54 46 gr.	54 to Flour, C. F. 150 gr.	F. FF.
Kegs, ℔	4½c	5 c	2½c
½ kegs ℔	4¾c	5¼c	2¾c
¼ kegs ℔	5 c	5½c	3 c
10 ℔ cans, 10 in case	6 c	6½c	5 c
10 ℔ cans less than 10	10 c	10 c	7½c

Emery Cloth and Paper.

Barder, Adamson & Co. ..... dis 50@50&5
H. H. Barton ..... dis 50@50&5

Emery Wheels.

Detroit ..... dis 60@70
Norton's ..... dis 60@70
Grant ..... dis 60@70
Sterling ..... dis 60@70
Celluloid ..... dis 10&33⅓
Northampton ..... dis 50
Crystal ..... dis 65@70
Vitrified ..... dis 60@70
Vulcanite ..... dis 60&10
Hamden ..... dis 60&10@75
Cyclone ..... dis 60@60&10

Files.

Arcade ..... dis 60&10@60&10&10
Nicholson ..... dis 60&10@60&10&10
" X. F ..... dis 25
Kearney & Foot ..... dis 60&10@60&10&10
Black Diamond ..... dis 60&10@60&10&10
McClellan ..... dis 60&10@60&10&10
Disston's ..... dis 60@70
Western ..... dis 70
Stub's ..... dis 25
Grobet's ..... dis 30
Reynolds Bros.' Hand Cut ..... dis 50
Industry File Works Hand Cut ..... dis 50

Hammers.

P. S. W ..... dis 40
Atha new list, Jan. 15, 1887 ..... dis 50
Heavy hammers and sledges under 5 lbs 12c
" " " " over 5 lbs 10c

Jack Screws.

Illinois Bolt Co. list ..... dis 75

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4½	4	3½	3⅛
Hexagon	15⅛	11⅝	8⅜	6	5¼	5¼	
Washers	9	8	7	5	4½	4½	4⅛

In lots less than 100 lbs, ℔ add ½c., 1 ℔ boxes add 1c to list.

Nails (wire).

List July 14, 1887 ..... dis 85
Standard Penny Nails, ℔ keg card rate
{ Car lots $2.25
{ Less than car lots $2.35

Oilers.

Zinc and Tin ..... dis 60
Brass and Copper ..... dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ℔ doz ..... dis 10@10&10

Picks.

Railroads, 5 to 6 lbs ..... $12 dis 60
" 6 to 7 lbs ..... $13 dis 60

Pulleys.

Iron Pulleys, Walker List ..... dis 50
Medart Pulleys ..... dis 50
Split Wood Pulleys ..... dis 55@60

Pulley Blocks.

Moore's Anti-Friction Differential Chain Pulley Block ..... dis 20

Rivets.

Iron, Thousand, list November 1, 1894 ..... dis 60@65
Iron, Ordinary, Cooper's Block and Carriage list November 1, 1894 ..... dis 60@65
Copper ..... dis 50@50&10

Taps.

Cards, Hand and Nut to 2 in ..... 1s 5s.
Carpenters' " " " ..... dis 50
Morse " " " ..... dis 50
Pratt & Whitney " " new list ..... dis 10
Machine Screw Taps ..... dis 55
Pipe Taps to 2¼ in ..... dis 70
Stay Bolt Taps ..... dis 25
Stove Bolt Taps ..... dis 55
Pulley Taps ..... dis 40

Vises.

Solid Box ..... dis 60
Parker's ..... dis 20@25
Prentiss ..... dis 20
Stephen's ..... dis 25@30
Barrett's ..... dis 30
Miller's Falls ..... dis 40
Merrill's ..... dis 15@20
Howard ..... dis 35

Wire.

New List, Apr. 9, 1894

Brass ..... dis 40
Copper ..... dis 40
Bright and annealed, Nos. 0@18 ..... dis 70&10@75
" " Nos. 19@26 ..... dis 75@75&5
" " Nos. 27@36 ..... dis 75&10&5
Coppered Nos. 0 to 18, market list ..... dis 70@70&5
Galvanized Nos. 0 to 18 " " ..... dis65&5
Tinned market Nos. 0 to 18 ..... dis 67½
Cast steel ..... dis 50
Tinned Broom Wire ..... dis 70&5@70&10
Annealed Fence, Nos. 8 and 9 ..... dis 75
Annealed Grape, Nos. 10 to 14 ..... dis 75
Stub's Steel Wire regular ..... 95c ℔ dis 35

Wrenches.

Coe's genuine ..... dis 50
Girard Standard ..... dis 70&10
Agricultural ..... dis 75&10
Mechanic's ..... dis 55&10&5
Bemis & Call's Combination ..... dis 35
Donohue's Engineers ..... dis 20&10
Lamson & Sessions Engineers ..... dis 65
Billings & Spencer's Drop Forged ..... dis 25
William's " " ..... dis 25
Alligator " " ..... dis 40

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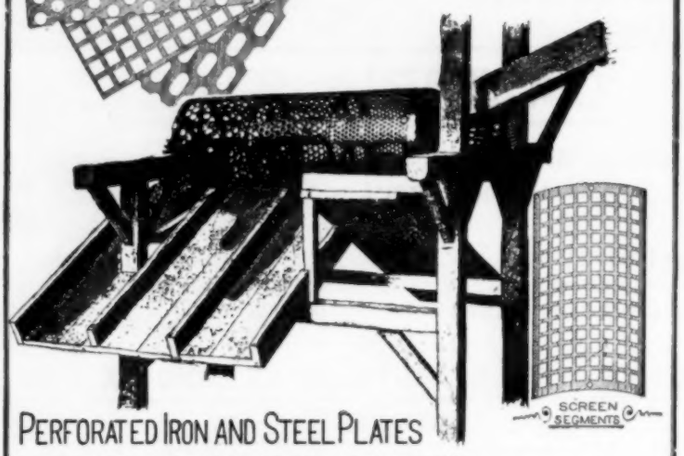

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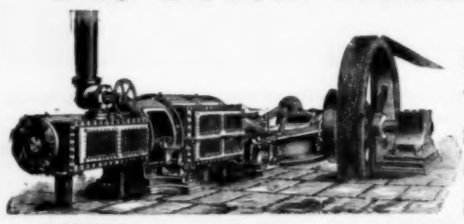

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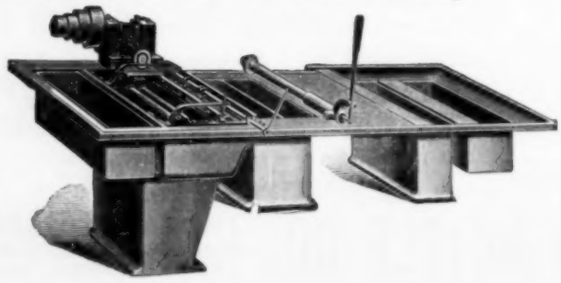

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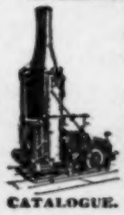

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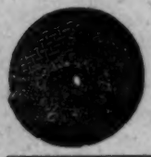

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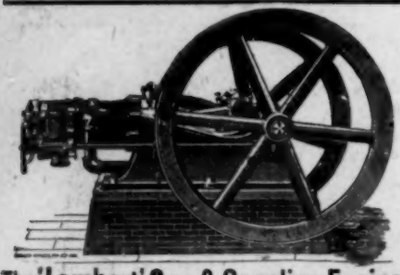

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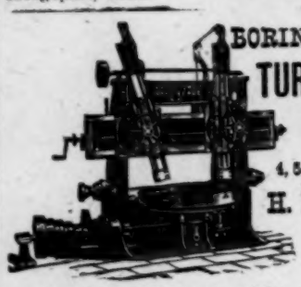

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